

University of Warwick institutional repository: <http://go.warwick.ac.uk/wrap>

A Thesis Submitted for the Degree of PhD at the University of Warwick

<http://go.warwick.ac.uk/wrap/4286>

This thesis is made available online and is protected by original copyright.

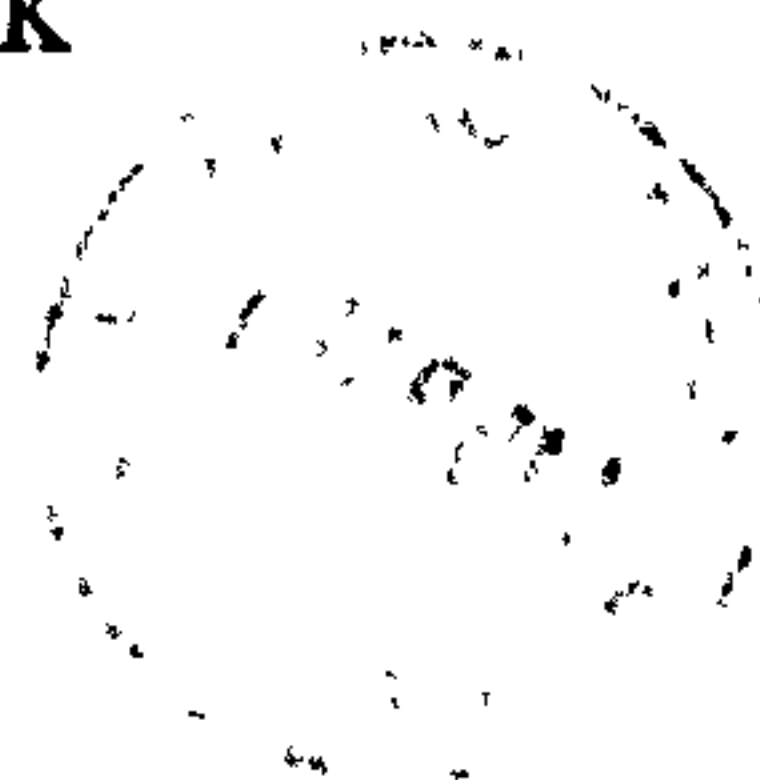
Please scroll down to view the document itself.

Please refer to the repository record for this item for information to help you to cite it. Our policy information is available from the repository home page.

An Application of the Contingent Valuation Method to an Excludable Public Good: The Case of Northampton's Parks

*Thesis submitted for the degree of PhD
at the University of Warwick*

Thomas Coskeran MA (Cantab) MSc Econ (London)
Department of Economics
University of Warwick



October 1998

Contents

Page Number

List of Tables	v
List of Figures	ix
Acknowledgements	x
Abbreviations	xi
Summary	xii

PART ONE A REVIEW OF THE CONTINGENT VALUATION METHOD

Chapter 1	Introduction and Overview	1
	1.1 Aims of the Thesis	1
	1.2 The Contingent Valuation Method	3
	1.3 Applications of the CVM	6
	1.4 The NOAA Panel Guidelines	10
	1.5 The Process of the CVM	12
	1.6 The CVM: Sustainable Development and Local Democracy	19
	1.7 A Preview	21
	Notes	22
Chapter 2	Northampton's Parks as Economic Goods	24
	2.1 The Parks of Northampton	24
	2.2 Parks as Goods	27
	2.3 A Classification Scheme for Non-market Goods	30
	2.4 Placing Parks in the Classification of Goods	35
	2.5 Concluding Remarks	38
	Notes	39
Chapter 3	The Value of Non-market Goods: Theoretical Considerations	42
	3.1 Introduction	42
	3.2 Measures of Value	42
	3.3 Measuring the Welfare Change of Park Provision	46
	3.4 Willingness to Pay and Willingness to Accept	52
	3.5 Non-use Values	53
	3.6 Theory and Survey Design	56
	Notes	57

Chapter 4	The Contingent Valuation Method Revisited	61
4.1	Introduction	61
4.2	Analysis and Application in Economics	62
4.3	Problems with Questionnaires	64
4.4	Difficulties in the CVM	67
4.5	The Biases of the CVM	73
4.6	Concluding Remarks	79
	Notes	80
 PART TWO VALUING NORTHAMPTON'S PARKS USING THE CONTINGENT VALUATION METHOD		
Chapter 5	Valuing Northampton's Public Parks: A Pilot Survey	82
5.1	Pilot Survey Design	82
5.2	Conduct of the Survey	86
5.3	Results from the Pilot Survey	90
5.4	The Determinants of Willingness to Pay: a Tobit Analysis	97
5.5	The Determinants of Willingness to Pay: a Logit Analysis	110
5.6	Problems Encountered and Solutions	116
5.7	Policy Proposals	119
5.8	Feasibility	122
	Notes	123
 APPENDIX 5.1 The Tobit Model		129
	Note	133
 APPENDIX 5.2 The Logit Model		135
	A5.1 The Basic Model	135
	A5.2 The Logit Model and the CVM	138
 Chapter 6	 A Contingent Valuation Survey of Northampton's Parks	 144
6.1	Changes of Approach	144
6.2	Administration of the Survey	145
6.3	Parks as a Council Service	148
6.4	The Nature of Parks	150
6.5	Considering Others	156
6.6	The Hypothetical Scenario: Cutting Maintenance or Selling a Park?	158
6.7	The Elicitation Procedure	163
6.8	Issues in Survey Design	165

	6.9	The Remainder of the Elicitation Procedure	173
	6.10	Socio-Economic Data and Other Variables	175
	6.11	Conclusions	178
		Notes	178
	APPENDIX 6.1	Socio-economic Characteristics of the Main Survey Sample	182
Chapter 7		Estimating Mean Willingness to Pay: The Use of Tobit Analysis	186
	7.1	Introduction	186
	7.2	Determinants of Willingness to Pay	187
	7.3	The Tobit Model with Heteroscedasticity	193
	7.4	Policy Considerations	198
	7.5	Concluding Remarks	201
		Notes	202
	APPENDIX 7.1	Explanatory Variables Used in the Econometric Analysis	204
Chapter 8		Estimation from the Dichotomous Choice Contingent Valuation Format	208
	8.1	Introduction	208
	8.2	Further Methodological Considerations	209
	8.3	Logit Analysis of the Principle of Paying Extra Council Tax	214
	8.4	Logit Analysis of Responses to Bid Questions	217
	8.5	Determining Mean WTP	232
	8.6	Non-Parametric Estimation	240
	8.7	Assessing the Estimates of Mean WTP	244
	8.8	Policy Considerations	248
		Notes	253
PART THREE		CONCLUSIONS	
Chapter 9		Valuing Northampton's Parks	265
	9.1	Reasons for Optimism	265
	9.2	Policy Conclusions	268
	9.3	Applying the CVM to an Excludable Public Good	271
	9.4	Recommendations for Northampton	273
	9.5	Thoughts on Future Research	275
		Notes	280

APPENDIXES		282
ONE	Pilot Survey Questionnaire (Council Tax as Payment Vehicle)	282
TWO	Pilot Survey Questionnaire (Entrance Fee as Payment Vehicle)	292
THREE	Pilot Survey Flash Cards	302
FOUR	Letter Sent to Pilot Survey Sample	317
FIVE	Follow-up letter to Pilot Sample	319
SIX	Main Survey Questionnaire	322
SEVEN	Main Survey Flash Cards	333
EIGHT	Letters to Main Survey Sample	349
BIBLIOGRAPHY		352

List of Tables

		Page
Table 1.1	Examples of Environmental Goods evaluated using the Contingent Valuation Method	8
Table 1.2	The NOAA Panel Proposals for the CVM	11
Table 2.1	A Classification Scheme for Goods	33
Table 3.1	Measures of Welfare Change for Non-market Goods	46
Table 3.2	Values Associated with Non-market Goods	56
Table 4.1	Forms of Bias in the Contingent Valuation Method	74
Table 5.1	Attitudes to Council Services	91
Table 5.2	Use of Parks by Respondents	93
Table 5.3	Activities in Northampton's Parks	94
Table 5.4	Source of Payments for Parks	97
Table 5.5	Description of independent variables used in estimation of the pilot survey regressions	100
Table 5.6	Tobit analysis of WTP of respondents for maintaining the current level of public park provision in Northampton - Council Tax as payment vehicle	101
Table 5.7	Heteroscedastic Tobit model for WTP of respondents for maintaining the current level of public park provision in Northampton - Council Tax as payment vehicle	106
Table 5.8	Tobit analysis of WTP of respondents for maintaining the current level of public park provision in Northampton - Entrance Fee as payment vehicle	108
Table 5.9	Heteroscedastic Tobit model for WTP of respondents for maintaining the current level of public park provision in Northampton - Entrance Fee as payment vehicle	111
Table 5.10	Logit analysis of pilot survey - Council Tax as payment vehicle	113
Table 5.11	Logit analysis of pilot survey - Entrance fee as payment vehicle	115

Table 5.12	Policy Proposals on Park Provision for Northampton Borough Council	121
Table 6.1	Attitudes to Council Services in Northampton	149
Table 6.2	How respondents would finance extra spending on parks	151
Table 6.3	Recall of Number of Parks Visited	152
Table 6.4	Parks Recalled by Respondents	153
Table 6.5	Features of parks contributing to personal enjoyments	155
Table 6.6	Reasons for Providing Parks	157
Table 6.7	Reasons for choosing to reduce spending on maintenance	161
Table 6.8	Reasons for choosing to sell one of the parks in Northampton	161
Table 6.9	Responses to Questions concerning Willingness to Pay Extra Council Tax	164
Table 6.10	Responses to Bid Values	166
Table 6.11	Sources of savings to make increased Council Tax payments	176
Table 6.1A	Reasons for not wishing to pay extra Council Tax	179
Table A6.1	Respondents by Age Categories	182
Table A6.2	Occupational Status of Respondents	183
Table A6.3	Household Income of Respondents	184
Table A6.4	Household Size	184
Table A6.5	Education Level of Respondents	185
Table 7.1	Observations used as the Dependent Variable in the Tobit Analysis	186
Table 7.2	Explaining WTP in a Tobit Framework with Homoscedasticity	188
Table 7.3	Estimates of mean WTP from Tobit assuming homoscedasticity	192
Table 7.4	A Heteroscedastic Tobit Model of Determinants of WTP	194

Table 7.5	WTP for 45 year old respondents derived from a Heteroscedastic Tobit Model	197
Table 7.6	Policy Proposals on Park Provision arising from the Tobit Analysis	199
Table A7.1	Independent Variable Employed in Tobit and Logit Analysis of the Main Survey	204
Table 8.1	Explaining WTP Extra Council Tax	215
Table 8.2	Logit model for those agreeing to pay more Council Tax	219
Table 8.3	Multivariate models obtained from Logit Analysis	220
Table 8.4	t-statistics for a Test of the Significance of Income at Various Income Levels	223
Table 8.5	Probability of Saying Yes to the Three Bid Levels used in the Survey for different income levels	225
Table 8.6	Coefficients and Mean WTPs obtained for each month of the survey	227
Table 8.7	The Effect of Adding Interaction Terms to Model (5) in Table 8.3	231
Table 8.8	Logarithm of the Bid as the Explanatory Variable	235
Table 8.9	Bid and the Reciprocal of the Bid as Explanatory Variables in a Logit Regression	236
Table 8.10	Calculation of the Constant Term for Estimating Mean WTP in the presence of explanatory variables in the logit function	237
Table 8.11	Turnbull cdf and pdf	243
Table 8.12	Measures of Mean WTP for Parks in Northampton	245
Table 8.13	Estimates of the Total Value of Northampton's Parks	246
Table 8.14	Matrix of Difference in Means Test Statistics for Mean WTPs	248
Table 8.1A	Individual Significant Relationships in Logit Analysis of Responses to Q9b and Q10e	254
Table 8.2A	Non-significant Variables in Logit Analysis of the Bid Levels	255

Table 8.3A	Membership of an Environmental Organization and Events as Explanatory Variables	256
Table 8.4A	Bid Level as Explanatory Variable for Respondents in Model (5) of Table 8.3	258
Table 9.1	Policy Prescriptions for the Parks of Northampton	270

List of Figures

	Page
Figure 5.1 Pilot survey value elicitation format used in valuing Northampton's parks	85
Figure 6.1 A schematic representation of the value elicitation format used in valuing Northampton's parks	159

Acknowledgements

I would like to express my thanks to Dennis Leech of the Economics Department at Warwick. As my supervisor, he has been a constant source of support and advice, both of which I have valued greatly. His willingness to devote time to my concerns was a valuable inspiration when difficulties sometimes seemed insurmountable.

This thesis was also carried out with the financial support of Nene-University College Northampton. I have been grateful to the College for this and the time provided to me to allow work on the thesis. It is a testament to the farsightedness of managers at the College that they are prepared to make the long term commitment that support of PhD study implies.

I have benefited as well from discussions with other students in the Economics Department at Warwick, colleagues at Nene and other researchers in the Contingent Valuation Method. Of these, I would especially like to mention Douglas Macmillan of Aberdeen University, who gave helpful advice at an important stage.

Last, and certainly not least, my wife and children have suffered from a certain neglect as I have pursued this particular goal. My thanks go to them for their forbearance, particularly as they may have not always understood my fascination with my chosen area of study. I hope they will have a full-time husband and father again in the near future.

Abbreviations

The following abbreviations are used in the thesis.

AIC	Akaike Information Criterion
cdf	cumulative distribution function
CV	Contingent Valuation
CVM	Contingent Valuation Method
LL	Log-likelihood
LR	Likelihood Ratio
pdf	probability density function
Q1 etc	Refers to Question 1 (etc) on the pilot or the main survey
WTA	Willingness to accept
WTP	Willingness to pay

Summary

This thesis discusses an application of the Contingent Valuation Method (CVM), a technique involving the use of questionnaire surveys, to the valuation of parks in the town of Northampton, England.

Urban parks are an example of a class of good, excludable public goods, to which the CVM has not been extensively applied. The application, therefore, breaks new ground in applying the technique to the particular case and in being the first use of the CVM for this type of good in the United Kingdom.

The thesis begins with a review of the nature of the CVM. A justification for using the method in the case of parks is then provided. Once theoretical difficulties surrounding the application are examined, an account follows of a pilot contingent valuation survey. The results of this and the analysis conducted on it are reported. Results from a main survey, which followed the pilot, are then discussed and analysed using both tobit and logit analysis. The implications of these studies are summarized in the concluding chapter.

The principal policy conclusions to follow from the work done are that:

- the Council could consider increasing expenditure on parks to reflect fully the preferences of the town's population;
- any increased spending on parks could come, at least in part, from a reduction in spending on highways in the town;
- parks could be used as part of a redistributive social policy;
- those on higher incomes could be expected to make greater contributions to the maintenance of parks.

A rationale for these and other policy recommendations are made in the final chapter, as are suggestions for further research into the application of the CVM to excludable public goods.

CHAPTER ONE

INTRODUCTION AND OVERVIEW

1.1 Aims of the Thesis

This thesis is concerned with using the contingent valuation method (CVM) to value the public parks in the town of Northampton. The CVM involves using a questionnaire survey to assess the monetary change required to keep an individual at a given level of utility when a hypothetical change in the physical amount of a good is supposed. It has characteristically been employed in valuing environmental 'goods' that possess a value to individuals, but which are not traded in markets.

In conducting the contingent valuation (CV) survey that makes up the core of the thesis, the aims were:

1. To determine if the parks in the town had a value to the residents of Northampton;
2. To estimate the size of this value by treating the parks as non-market environmental goods;
3. To assess the validity of applying the technique to an excludable public good;

4. To identify policy implications for the town of Northampton and its Council from the results of the survey;
5. To assess whether or not there was an appropriate level of provision of parks in the town.

The intention was to see if it would be possible, using a technique normally applied to the valuation of environmental assets that are pure public goods, to generate practical ideas for open space management in a town where public park provision is at a relatively high level.

The local focus does not mean, however, that this thesis would not interest wider audiences. Thus, for practitioners of the CVM, this study is an application of the technique to a type of a good to which it has not previously been applied, at least in the United Kingdom. Policymakers in other towns and cities may also wish to reconsider their provision of a local asset in the light of the results reported from Northampton. Finally, those economists who are not CV specialists can benefit from seeing how questionnaire surveys can be a valid tool for the profession.

The statement of aims above provides a starting point for the arguments in the rest of this thesis. Before beginning the discussion in Chapter 2, however, the CVM and its application by economists to valuations of other environmental assets is described in the rest of this chapter. The CVM can be seen as an established technique amongst

economists and that in applying it, this study is drawing upon a distinct, if sometimes controversial, body of ideas.

1.2 The Contingent Valuation Method

The CVM reflects the straightforward view that if you wish to value a non-market good you go and ask people what their valuation of the good is. The directness of such an approach has a superficial attraction but one that concerns many economists. The idea that you should listen to what people say rather than observe what they do is not one which fits easily with their methodology. Friedman (1953), a key influence on economists' methodology in recent times, saw the use of questionnaire surveys, upon which the CVM is based, as irrelevant to economists in establishing how people behave. Others, like Diamond and Hausman (1994), criticize the hypothetical aspect of the technique. If those asked about their valuation never have to part with real resources, they contend, the CVM is unreliable, for what people say they might do may not reflect what they would do when faced with real choices.

Despite controversies surrounding use of the CVM, the method has been and remains an important tool for environmental economists concerned with valuing environmental resources. It meets what Kahneman and Knetsch (1992) call "a substantial demand for a practical technique for measuring the value of non-market goods." This demand has arisen because policymakers wish to make rational decisions about the use of what are seen as increasingly important natural resources.

The implication should not be, however, that interest in the results of CV surveys is restricted to policymakers alone. Other interested parties could include environmental pressure groups, residents local to an asset under consideration or companies, whose activities are being assessed by the valuations being undertaken. These groups will be as interested in assessing the value of environmental goods as the authorities who commission the surveys, although some may be sceptical of adopting an approach based on the philosophy of the market.

The method works by presenting ‘consumers’ of a non-market good with a hypothetical change in the provision of a good. In posing a question to the respondent, the CV researcher is often attempting to determine the WTP of the respondent for a particular non-market good.

Typically, applications of the CVM have sought answers to three questions, namely:

- a) what value should be placed upon certain types of ‘environmental asset’;
- b) what would be the likely impact of public policies on the natural environment;
- c) how could the costs associated with environmental damage be estimated.

Much of this thesis is, as indicated in Section 1.1, given over to answering the first two of these for Northampton’s parks, but it is, in fact, the last that has had a significant effect in attracting attention to the CVM in recent years. For example, the technique has become prominent in the United States amongst techniques available

for valuing environmental non-market goods^{1a} as it has been used to assess environmental damages in legal cases. Hanley and Ruffell (1993) have pointed to use of the CVM by the Fish and Wildlife Service in the United States for considering the valuation of damages caused to species. The technique also determines the levels of compensation in actions brought under the 1980 Comprehensive Environmental Response, Compensation and Liability Act of that country, despite some concerns about the appropriateness of doing this reflected in legal actions that have taken place in the United States courts².

The CVM became newsworthy after the *Exxon Valdez* disaster of 1989 when used to estimate the environmental damage caused by that disaster. A figure of \$3 billion created a stir outside the world of the CV researcher. The Oil Pollution Act of 1990 in the United States, which also followed the *Exxon Valdez* incident, required the National Oceanic and Atmospheric Administration (NOAA) to assess methods for measuring damages caused by future oil spills. This led to the establishment of a 'blue ribbon' panel of economists to assess the viability of the CVM as a research tool in this area. Their report, Arrow et al (1993), both assisted in providing a framework of practices to be adopted in the CVM and gave the technique what amounted to a sound, if very conditional, as Randall (1997) put it, endorsement. It is discussed in more detail in Section 1.4.

Experience with the technique has not been limited to the United States. Bateman et al (1994) summarize the main applications in the United Kingdom up to that time.

^a Throughout the thesis, numbered superscripts refer to notes at the end of each chapter.

Navrud (1992) outlines applications of the technique in a number of other European countries.³ The Department of the Environment (1991) in the United Kingdom has also shown interest in the method as a means for valuing environmental goods, as discussed in Bateman and Langford (1997).

The CVM has not been restricted to environmental issues. Jones-Lee et al (1995), O'Reilly et al (1994), Ehrenberg and Mills (1990) and Johannesson et al (1992) show how the technique has been applied in areas as diverse as traffic road injuries, the value of broadcasts and health concerns.

A final mention should be given to Mitchell and Carson (1989). Although they would deny it was a handbook, Mitchell and Carson (1989) has, at the very least, become regarded as an essential text for those wishing to use the CVM. Along with Arrow et al (1993), it has contributed to a process of codification, by setting out guidelines for the conduct of CV surveys. The extent to which the CVM has become an established procedure can also be demonstrated by the range of applications in environmental economics. These are now examined.

1.3 Applications of the CVM

The idea of the CVM originated with Ciriacy-Wantrup (1947), who suggested assessing the benefits of avoiding soil erosion by asking those affected by it. First put into practice by Davis (1963), the inexorable rise of interest in applying the

technique throughout the 1970's and 1980's is literally plotted in Mitchell and Carson (1995). Carson et al (1994) also reported in their bibliography of the CVM that from virtually zero in the early 1970's the total number of completed CV studies had risen to 1674 by 1994, a figure which continues to rise. Cropper and Oates (1992) noted how this growth was part of a response by economists to the lack of practical policy suggestions for dealing with the environment in general and the valuation of non-market goods in particular when the environment first became a wider policy question in the 1960's. The full extent of applications that have taken place can be seen in Table 1.1, which gives examples of studies that have evaluated various assets using the CVM.

Applications have not been restricted to the developed world. Applications of the CVM in developing countries, began with studies by, amongst others, Jimenez (1987), Brown and Henry (1989), Whittington et al (1990), Briscoe et al (1990), Bohm et al (1993) and Singh et al (1993), Altaf et al (1993), Navrud and Mungatana (1994), Swallow and Woudyalew (1994), Boadu (1992), Whittington et al (1992), Whittington et al (1993) and Altaf and Hughes (1994). Jimenez (1987) applied the technique to problems of education and health provision, but many initial studies considered the demand for either water or sanitation services, so emphasizing the different environmental concerns in developing countries and, a key feature of the CVM, its flexibility in being applicable to many different settings.

More recently the range of applications of the CVM in developing countries has expanded to incorporate issues like air and water pollution and the value of tropical

Table 1.1: Examples of Environmental Goods evaluated using the Contingent Valuation Method

<i>Natural assets</i>	<i>Location of Study</i>	<i>Study where asset valued^a</i>
<ul style="list-style-type: none">• Beaches• Forests and Woods• Rivers and Lakes• Heathland• Cliff tops• Animal Species• Tropical Rain Forests• Wilderness areas• Upland vegetation• Wetlands	<ul style="list-style-type: none">United StatesSwedenUnited StatesUnited KingdomUnited KingdomUnited StatesMadagascarUnited StatesUnited KingdomUnited States	<ul style="list-style-type: none">Silberman et al (1992)Li and Mattsson (1995)Loomis (1996)Hanley and Craig (1991)Penning-Rowsell et al (1992)Whitehead (1992)Shyamsundar and Kramer (1996)McFadden (1994)Powell (1993)Whitehead et al (1993)
<i>Recreational environmental goods</i>		
<ul style="list-style-type: none">• Nature reserves• National parks• Town parks• Access to fishing/hunting	<ul style="list-style-type: none">SpainUnited KingdomUnited StatesUnited States	<ul style="list-style-type: none">León (1996)Bateman et al (1994)Combs et al (1993)Bishop and Heberlein (1979)
<i>Socially produced environmental goods</i>		
<ul style="list-style-type: none">• Reservoirs and Canals• Landscape improvements• Sea and river defences• Water/sanitation services• Insect control• Afforestation of peatlands• Welfare of farm animals	<ul style="list-style-type: none">United KingdomFranceUnited KingdomGhanaEthiopiaIrelandUnited States	<ul style="list-style-type: none">Willis and Garrod (1991)Bonnieux and Le Goff (1997)Bateman et al (1995)Whittington et al (1993)Swallow and Woudyalew (1994)Hutchinson et al (1995)Bennett and Larson (1996)
<i>Environmental quality</i>		
<ul style="list-style-type: none">• Air quality in towns and country• Water quality in rivers, lakes and sea• Municipal waste sites• Natural resource damage assessment• Road traffic effects• Food quality• Noise pollution	<ul style="list-style-type: none">United StatesUnited StatesUnited StatesUnited StatesSwitzerlandUnited StatesSwitzerland	<ul style="list-style-type: none">Hoehn (1991)Carson and Mitchell (1993)Margai (1995)Harrison and Lesley (1996)Soguel (1995)Caswell (1995)Soguel (1996)

Note: ^a Valuation of the asset was not always the main aim of the study indicated, but in all cases the asset was valued.

rain forests, as shown by the work of Choe et al (1996), Shyamsundar and Kramer (1996) and Alberini et al (1997). The latter use is, as Carson (1998) points out, an important step for the CVM, as it means that techniques will need to be sought that permit application of the method at the global and not just regional or national level as has been the case in the past. Overall, however, application of the CVM in developing countries is still limited when compared to the developed world. In the context of this thesis, Elegbede et al (1977) emphasize these differences when they suggest that assets such as public parks are a luxury in the developing world. It is likely to be some time, therefore, before an application of the CVM to the problem of public park valuation, as discussed in this thesis, is likely to be seen in a developing country.

Applications of the CVM in the developing world, however, are not wholly dependent upon the technique's application in the United States or Europe.

Whittington et al (1992) is a good example of how using the CVM in a developing country can produce results of interest to researchers in the developed world. Their study was the first to broach the idea that giving respondents time to think when conducting a CV survey may lead to better results than the more usual approach of requiring an immediate answer.

In many CV studies, authors conclude that the results represent reasonable estimates of the demand for the object of study, a view usually based on econometric analysis providing results consistent with economic theory. Despite this apparent success, the technique did not appear for some time to have a consistent framework in which

researchers could work. An important step forward, therefore was the NOAA panel's report. Given its importance, a brief outline of its recommendations follows.

1.4 The NOAA Panel Guidelines

Arrow et al (1993) set out a number of guidelines for researchers applying the CVM summarized in Table 1.2. These can be modified in certain circumstances, as Arrow et al (1993) concede, so they do not represent a straitjacket. The panel, as Randall (1997) describes, also suggested that a CV survey would be invalidated if the results of a study exhibited:

- high non-response rates to the survey instrument;
- lack of a belief in the scenario amongst respondents;
- lack of understanding of the task to be undertaken in the survey;
- responses explained by factors other than the costs identified;
- lack of responsiveness to the scope of any loss.

The NOAA panel's views on the CVM's worth are not universally shared. In a well-known case, an investigation into the CVM by Cambridge Economics Inc (1992), funded by Exxon after the CV study into the effects of the *Exxon Valdez* disaster, concluded that "Contingent valuation (CV) does not provide a reliable method to calculate natural resource damages". As will be seen, there are other

Table 1.2: The NOAA Panel Proposals for the CVM

- Use of a single dichotomous choice question for eliciting value in a format replicating a tax referendum
 - Use of a WTP format and not WTA format in the value elicitation question
 - Personal face-to-face interviews with respondents
 - Full reporting of the data and questionnaire used in a CV survey
 - Use of a pilot survey prior to full testing
 - Accurate information on the valuation problem to be provided to respondents
 - Respondents to be reminded of possible substitute commodities
 - Samples to be taken at different times to avoid possible time dependent results
 - A 'no-answer' option to be explicitly included in the value elicitation question
 - Surveys to assess the sensitivity of respondents to the scope of the good being valued
 - Reasons why respondents agreed or did not agree to value elicitation question to be sought
 - Surveys to seek information on socio-economic characteristics to assist in interpretation of responses
 - Respondents to be reminded of alternative expenditure possibilities
 - A large sample size (1 000 plus) to be used
 - Samples with high non-response rates (greater than 30%) are likely to be unreliable
-

critics, but before the disputatious nature of opinions surrounding the method are fully aired, it is useful to consider how it is meant to operate.

1.5 The Process of the CVM

In the CVM, the valuation of the consumer is contingent upon the hypothetical situation with which they, as a respondent, are faced in a questionnaire survey.

Hoehn (1987) argued that there are five key elements in the design of a CV format, namely:

1. The Presentation medium - the period in which contact between the interviewer and the respondent is established and the nature of the situation to be considered is outlined;
2. Description of the policy impacts under consideration;
3. The method by which the policy would be provided;
4. The method of payment that would be used;
5. Elicitation of the value placed upon the change by the respondent.

The list remains valid, although to it could be added the inclusion of a set of questions that obtain from the respondent data on their socio-economic background. The latter has increasingly acquired significance in helping to establish the determinants and levels of mean WTP in a way not evident at the time Hoehn was writing. Lazo et al (1992) also note that two principles for CV survey design quickly

became established once the method gained popularity. These were that the commodity to be valued must be well defined and a realistic payment vehicle must be used when asking respondents to consider WTP or WTA.

Examples of survey instruments used in actual studies are provided in Mitchell and Carson (1989), who give an example of a survey instrument to establish the benefits from improving national freshwater quality in the United States and in Kealy and Turner (1993). Powell (1993) provides a British example.

As Markandya (1988) describes, surveys can be conducted through personal interview, mail survey or telephone interview. Of these, Arrow et al (1993) considered personal interviews to be the most effective as they allowed interviewers the opportunity to obtain direct feedback from the respondent on both the survey itself and the attitude of respondents in answering questions. The method can, however, be time consuming and this raises resource questions for the researcher.

Attention has also been devoted to methods by which the survey instrument is developed, Carson and Mitchell (1995), for one, emphasizing the importance of survey design in avoiding results inconsistent with economic theory. The first of these, focus groups, discussed in Hutchinson et al (1995), assist the researcher by ensuring scenarios presented to respondents are intelligible and realistic and help to identify an appropriate payment vehicle for the survey. A detailed account of focus groups in a CV application can be found in Smith et al (1997).

A pilot survey will ensure the survey instrument is comprehensible to potential respondents. In Loomis et al (1994), the pilot survey was followed with a checklist in which respondents were asked about their understanding of the issues that had been raised in the CV survey. This is one approach to the improvement of the survey instrument. Another involving the use of verbal protocol analysis, a technique borrowed from the field of psychology, has been applied by Schkade and Payne (1994) to the question of CV survey design. These methods are resource intensive and, consequently, it was not felt possible to apply them all in the CV survey valuing Northampton's parks. A pilot survey was, however, as outlined in Chapter 5, conducted to establish the feasibility of the technique. It informed, as confirmed in Chapter 6, the nature of the main survey.

A further important and related issue is the question of providing information to respondents on the nature of the good to be evaluated. As Whitehead et al (1995) discuss, acquiring information determines how individual respondents set their values in the CV survey. They suggest that if no information is available to respondents they will not be prepared to pay for the resource even if they might well value it positively when supplied with adequate information. Information has a role to play in determining WTP and the amount of information can be dependent upon how much is fed into the CV process by the researcher in the survey document. Cummings et al (1986) suggest "researching (respondents') preferences" by asking about attitudes towards the non-market good in question so that they can begin to consider why they might value the good. When posed the value elicitation question,

they have already reflected upon the extent to which they obtain benefits from the good and are able to give a reasoned response to the question.

This view, as with many others in the CVM, is not uncontroversial. Kahneman and Ritov (1994), for example, have suggested that much of the explanation which it is felt ought to be provided to respondents is, in fact, actually of little importance. Robust results, they argue, are obtainable simply by giving respondents fairly general headings on issues that replicate newspaper headlines.

A consensus amongst CV practitioners, and one ratified by Arrow et al (1993), is that those questions in a CV survey designed to obtain the good's value from respondents (the value elicitation format) should be put in a way that asks respondents if they would be prepared to pay a fixed amount either for an improvement in the quality or quantity of an environmental good or to avoid a deterioration in its quality or quantity. The amount put to the respondent in this way is referred to as the bid level. The willingness-to pay referendum or dichotomous choice format is said to match the consumer problem in normal market transactions, when, typically the decision being made is about buying a good being offered for sale at a fixed price. Hoehn and Randall (1991) also suggest this format is incentive compatible for respondents in a way other formats are not.

The two main alternative formats, the open ended and iterative bidding formats, are summarized by Bateman et al (1994) in the context of testing them for 'biases'⁴. The open ended format asks respondents to state the amount they would be prepared to

pay for a good; the iterative bidding format provides an initial bid level, but one that is then followed up with higher or lower bids depending upon the respondent's original answer in a process that can go through many iterations. Herriges and Shogren (1996) provide diagrammatic representations of alternative formats for the dichotomous choice bidding format which involve the use of follow-up questions.

Bateman et al (1995) consider how the three formats can produce differing WTP values, although in their study the results obtained can have as much to do with the truncation strategy used when analyzing the WTP data as with the value elicitation format.⁵ Kriström (1993) also investigated possible differences in results from open-ended (or continuous) and referendum format (or discrete) value elicitation questions, as did Lunander (1998). The open-ended format, however, has been thought to be inappropriate because it does not match situations with which respondents are normally faced in real markets.

The consensus on the use of dichotomous choice questions has been challenged by some, including Cummings et al (1995), who suggest that the dichotomous choice approach can give misleading estimates of payments. The evidence on this issue is, however, ambiguous. Frykblom (1997), for example, shows that a hypothetical dichotomous choice format works well in situations where respondents believe that they will have to make real payments. At present, the dichotomous choice approach remains the dominant one in CV applications.

The scenario presented to respondents in the sample ought also to be related to an event that could occur in the future and not some event that has already occurred. As Combs et al (1993) suggest, fortuitously enough when valuing public parks, the CVM works best when the valuation question is perceived as meaningful to future policy decisions.

Other information about the demand for the good is usually collected by questions on issues such as social background, the use of the asset in question and general attitudes towards the environment. The exact nature of these questions depends upon the good being valued.

Once the survey is designed, researchers must then find suitable respondents. One solution is to visit a busy shopping street and adopt a 'next-to-pass' basis for sampling, in which the first passer-by is approached after each interview is completed. This type of 'shopping mall' survey has become somewhat discredited, however, because respondents in these situations often have other things on their mind than responding meaningfully to survey questions. It does exist, however, in the literature. Cobbing and Slee (1993), for example, obtained their sample in this way.

An alternative is to use students, if the researcher is from a university, or those at the researcher's workplace. Such 'convenience sampling' is found in published surveys, as Bennett and Larson (1996) demonstrate. Arrow et al (1993) deemed it acceptable for piloting surveys. A further possibility is to visit the site of a good being valued

and survey those there. This allows collection of more information about the good itself, but, by definition, the survey is of those who presumably value the good relatively highly, since they are using it, so biasing results.

As best practice, Arrow et al (1993) suggest that potential respondents be approached by writing to them at their home address and then visiting them to conduct a personal face-to-face interview. Although this raises the cost of a survey, it does ensure that respondents are both likely to be more relaxed in their own home and, consequently, willing to give their full attention to the task of replying to the questionnaire. This was the approach adopted in this thesis.

Once the data are collected, issues arise about whether they can be relied upon to draw conclusions about the value of the good considered in the survey. The validity of the CVM, that is the extent to which values measured by a CV survey reflect theoretical definitions of value such as compensating and equivalent surplus, differs from the notion of its reliability. Whitehead et al (1995) define reliability as the stability of the measure of value over time and the extent to which it is due to random effects. Validity on the other hand, as Smith (1996) points out, requires that CV researchers identify certain characteristics that CV estimates ought to have and then test for them. The three most important characteristics usually identified are:

1. estimates should be sensitive to the scope of the good being provided
i.e. the more that is provided, the greater should be respondents' WTP;

2. stated WTP values should be consistent with economic variables that would be thought to have an impact on the WTP e.g. income, number of substitutes etc;
3. different types of goods should lead to different WTP answers in CV surveys.

These represent three grounds for accepting the results of a CV survey as reasonable measures of the valuation of a non-market goods, although there is a complication with the last, as Smith (1996) suggests, in that what constitutes a 'different' good depends upon the preferences of the individual. Thus, even if a CV survey shows no difference in the responses to supposedly different goods, this may simply be because the respondents do not perceive them as different.

This introduction to the process of the CVM concludes the consideration of the basic technique. Two final features of the method, however, discussed in the next section, go beyond its use as a means for valuing non-market environmental goods and concern its relationship to the principle of sustainable development and the role of local democracy.

1.6 The CVM: Sustainable Development and Local Democracy

Use of the CVM is consistent with the principle of sustainable development outlined by the Brundtland Commission in World Commission on Environment and

Development (1987). Even the notion of 'weak' sustainability, developed in response to criticisms of the Brundtland Commission's 'strong' version and summarized in Turner (1993), requires the application of the CVM in modifications made to the economic appraisal of projects. More pertinently, the idea of sustainable development makes the CVM more acceptable as sustainability becomes an increasing part of government agendas. This is not to say that adopting the principle of sustainable development as a basis for policy is essential to the growing importance of the CVM. Beckerman (1994), who advocates abandonment of the whole sustainable development project, still concludes that "research into the economic evaluation of environmental assets" is going to be an important element in addressing environmental issues in the future.

Even if the future of the CVM is not closely linked to sustainable development, its role in local democracy can be important for its future success. The political process may, in some circumstances, be insufficiently developed to enable public participation in, say, the planning process. This would, therefore, allow a role for the CVM, as has already been indicated, as a means to allow people to express their views on policy matters. This argument has not been much pursued in the developed world, but is an aspect of the technique that has been of interest to researchers in developing countries. Altaf and Hughes (1994) were particularly interested in this idea. Their views on the CVM as a form of economic democracy are echoed by Swallow and Woudyalew (1994), who suggest that the participatory nature of the CVM encourages valid responses to CV surveys.

A view of the CVM as a form of democracy may, however, be a little too sanguine. For one thing, it is not clear, either in theory or practice, who determines when a CV survey is to be conducted. The decision to apply the CVM implies considerable power to influence the progress of a particular project. As long as no means exist to identify how these decisions should be taken, the CVM remains a rather blunt instrument of democracy.

1.7 A Preview

The above sets out the background to the CV survey in this thesis, which extends the use of the CVM to urban parks, a good which has not been greatly explored by other practitioners of the CVM. Valuations of national parks are well represented in the literature, but only Combs et al (1993) had attempted to value urban parks using the CVM when this study was conducted and theirs is an American example. Brookshire and Coursey (1987) came closest to this in valuing trees in an urban park. Bateman et al (1994), in their review of applications of the CVM in the United Kingdom, also do not identify an application that valued urban parks. The case of applying the CVM to Northampton's parks, therefore, is arguably the first example of an application to this type of good in the United Kingdom.

With the scene set, the discussion now continues in Chapter 2 with an examination of park provision in Northampton and an identification of the reasons why parks can be valued using the CVM. In Chapter 3, theoretical questions related to the CVM

are raised. The difficulties associated with the CVM are examined in greater detail in Chapter 4 as an assessment of the technique's limitations. In the second part of the thesis, the results of first, the pilot survey, in Chapter 5, and then the main survey, in Chapters 6 to 8, are presented. Chapter 5 also outlines the econometric techniques applied to the data. These form the basis of the argument in Chapters 7 and 8, when applications of tobit and logit analysis to the data from the main survey are discussed. Chapter 9 summarizes the policy recommendations of the previous chapters, gives some thoughts on the limitations of the thesis and suggests how the results obtained provide the foundation for future research.

Notes

1. Other techniques for valuing the environment are discussed in Pearce and Markandya (1989). Dobb (1993) and Kask and Maani (1992) are, respectively, examples of the travel cost and hedonic price methods, both of which are important alternatives to the CVM.
2. Accounts of the case brought by the State of Ohio against the use of the CVM under the provisions of the 1980 Act and the arguments surrounding the case can be found in Cummings and Harrison (1994) and Brookshire and McKee (1994). The former account is more hostile to the CVM than the latter.

3. Interest is not limited to English language researchers, as Signorello (1992) and Wierstra et al (1996) suggest.
4. Biases in the CVM occur when the value obtained from the CV survey does not match the 'true' value. They are considered in more detail in Chapter 4.
5. Truncation is the omission of a certain number or percentage of the highest bids, usually because they are thought to represent an excessively high proportion of a respondent's reported income.

CHAPTER TWO

NORTHAMPTON'S PARKS AS ECONOMIC GOODS

2.1 The Parks of Northampton

The first section of this chapter provides background on the parks of Northampton. It highlights their important status in the town and suggests reasons why this study was conducted. The account is not exhaustive, but follows the practice in the CVM literature of providing details on the institutional and historical setting of the issue under consideration.

Northampton has, as Adkinson (1980) notes, long been generously endowed with open spaces, although, relative to the length of the town's history, this provision is a recent phenomenon. Only in 1897 did the first designated public park open, although by 1925 Northampton had more public parks per head of population than Boston, USA, considered at that time to be a model of urban park provision. By 1958, 40% of the land in the borough was devoted to open space that included public parks. Today, the council responsible for their upkeep, Northampton Borough Council, maintains over 788 hectares of parks and open spaces.

The place of parks in Northampton's urban landscape arises partly from local geography, which requires the maintenance of a flood plain for the River Nene that flows through the town. This natural feature has been combined with endowments of

parks to the town from rich landowners over the last hundred years, of which the best example is the town's principal park, Abington Park. The taking into ownership by a series of local councils of common land further increased the stock of parks in the town. The Racecourse park owes its existence to this type of arrangement.

The proliferation of parks has meant, as Adkinson (1980) confirms, that they have traditionally constituted an important element in the leisure of Northampton people. Brown (1990), in fact, suggests that social historians who perceived inter-war Northampton as a town with poor leisure facilities failed to recognize the important role parks played there in the leisure time of people. It is to establish whether this assertion of the value of Northampton's parks for leisure purposes is consistent with the values placed upon them by today's residents that the CV survey in this thesis is, in part, concerned, but it is interesting to note that a consistent theme of historical accounts of the town provided in Adkinson (1980), Barty-King (1985) and Brown (1990) is one of parks as a highly valued asset.

Northampton's recent history has also affected the stock of parks in the town. The town experienced major growth during the 1970's and 1980's after being designated a 'new town' for accommodating overspill populations from cities such as London and Birmingham.¹ As Barty-King (1985) describes, one possibility when developing the 'master plan' for expansion, would have been to use some of the parks for development. Wilson and Womersley (1969), however, who wrote the final draft of the master plan, thought, along with others, that parks were a considerable asset for the town both before its expansion and in its expanded form.

The plan went further, in fact, than simply retaining existing parks. It had built into it the notion that the “attractive development of open space” would be a key feature of the new areas of the town. As the town’s geographical boundaries expanded, therefore, the number of parks was not just maintained but increased. Woolham (1995), in a recent profile of the Eastern Districts that represented a significant proportion of the increased land area of the expanded town, confirms that planners were largely successful in achieving their aim of providing a “continuous open space system”. Adkinson (1980), too, refers to the creation of new parks at Lings, Blackthorn and Round Spinney when the town expanded.

Parks in Northampton are used intensively for entertainment purposes, which complements their role as areas of open space designed to replicate the countryside in the peace and quiet, fresh air and possible access to wildlife that they offer. These alternative uses of the parks can lead, as Adkinson (1980) states, to a conflict between parks as ersatz countryside and their use as locations for a variety of entertainments.²

This brief account raises questions for the economist. The first concerns how far existing provision of parks in Northampton reflects previous rather than current generations’ preferences. Whilst, as Brown (1990) reports, parks may have been viewed as considerable assets for the town in 1899, that perception may not be shared by the town’s existing residents. Second, the level of provision is not constrained by geography, as the Dutch have shown in reclaiming flood plains. Northampton need not, therefore, be constrained by nature into having a large

percentage of open spaces. If the demands for uses other than open space were sufficiently high in the population, even flood plains could be converted to alternative uses.

A further issue concerns potentially conflicting uses for parks. If parks can either be viewed as attempts to bring the countryside into the town or as forms of leisure complex, decisions have to be made about the competing uses to which they are put. This problem, of course, is the very stuff of economics, which results from a CV survey can help to illuminate. Finally, a question arises about what type of good parks are, which is so fundamental to using the CVM to value parks that it takes up the rest of this chapter.

2.2 Parks as Goods

Urban parks, as in Northampton, are normally provided free to the user, a characteristic frequently written into their provision. The Royal Parks Agency in London, for example, has specified as an objective the need to maintain free access to parks for the public. For economists, therefore, the value of parks to users cannot be determined from the price the user pays in a market transaction, since no such transaction takes place. Economists also perceive the value that parks possess just like the value for any other good, namely as a reflection of the benefits obtained by individuals and, as for any other good, this value should be taken into account in any decision involving their exploitation.³ The problem is that markets, the economist's

favoured mechanism for establishing values for goods, will not exist for parks.

Techniques need to be employed, therefore, that measure their value when developments occur that might damage or destroy them. In short, parks are non-market goods, the value of which can be determined using a method like the CVM.

The difficulty with the above argument, however, is that it does not always reflect either the principles underlying or the reality of park provision. It is possible both to conceive of parks as a private market good and for them actually to be so. As an instance, at least one of the parks in the city of Bath requires users to pay an entrance fee. The type of economic good parks are, therefore, is not necessarily a settled question. Faced with ambiguity about the nature of the good being considered, it can be helpful to consider the benefits parks provide as a good. Their identification allows placement of parks into a classification of goods, outlined in Section 2.3. The exact place of parks within this classification is discussed in Section 2.4. How this exercise provides a justification for using the CVM to value Northampton's parks is explained in Section 2.5.

As goods, parks generally provide benefits to users as a leisure facility. The range of leisure uses, even in a single park, can, as Welch (1995) discusses, be extensive.

Users can include groups as disparate as picnickers, sportsmen and women, dog walkers, children playing, horticulturists and nature lovers. This range of activities can bring different users into conflict with each other, as highlighted above, so that, whilst benefits to a given user are private to that user, they can depend upon how

others use the park. Such congestion externalities, whereby users impose costs on others through their decision to consume an open access good, are familiar to economists in contexts other than parks.

Parks can also provide some benefits that extend beyond those obtained by the user. For example, Brown (1990) discusses how Northampton's parks were originally provided to give potential troublemakers alternative uses for their leisure time. To the extent that this type of benefit existed and still exists, parks generate benefits to those who might otherwise suffer from unsocial behaviour. These beneficiaries may never enter a park, but still profit from their existence.⁴ The external benefits of park provision are also evident in their role as environmental assets in a town. As the Royal Parks Review (1992) states, "parks provide an area in which nature, even if well pampered, reigns supreme" .

A final point concerning the benefits of parks relates to children as users. Parks often have facilities for children and they can be major beneficiaries of this good. Typically, however, children will not be well placed to reflect their demands through market mechanisms as they will be dependent upon the income of parents or guardians. In such circumstances authorities may feel impelled, as, say, with education, to act as proxy consumers for this group.

The above suggests that the benefits parks provide for an urban population exceed those to individual users. This would undermine the notion of parks as a private good, a situation compounded when the costs of excluding non-users from parks if

charges were considered. The example from Bath, therefore, depended upon the park only having one realistic point of entry, which kept the costs of providing fences, park attendants, turnstiles etc to a minimum. In other situations, these could be expensive. Poole (1980) also notes the aesthetic costs of exclusion and the inconvenience caused to users by their adoption. Combined, these costs could well exceed revenue raised from charges. The exclusion technology of park provision is an important element, therefore, along with external benefits, in considering parks as a good. How this is so is addressed more fully in the next section.

2.3 A Classification Scheme for Non-market Goods

The discussion in Section 2.2 suggested parks are a good where, although benefits often go to the user, they will not be restricted to this group. Furthermore, the provision of parks is likely to be made free to users because of problems associated with excluding non-users. These two characteristics can be used to determine the nature of parks as a good in a general classification for all goods based on three elements (non-excludability, non-rivalry and institutional trading arrangements) which is now presented.

Two of the elements are well known in the literature on public goods. Non-excludability means that a good provided to one consumer is provided to all, the producer being unable to stop other consumers using the good. National defence is the standard textbook example of such a good. Atkinson and Stiglitz (1980) argue that

non-excludability is essentially a technological problem arising because producers cannot enforce their property right to charge for the good as technology to do so does not exist. This definition is not straightforward, however. For example, education to the age of 16 in the United Kingdom is non-excludable not because of technological problems but because the government chooses that it should be so. Similarly, externalities in consumption or production of a good may mean that only some of the benefits associated with consuming a good are non-excludable. The good then has only a degree of non-excludability and cannot be defined as purely non-excludable.

The second element, non-rivalry, refers to consumption of a good by one person being unaffected by any other. Atkinson and Stiglitz (1980) see this feature as essential to distinguishing a private from a public good. The former is one where a change in the consumption of one unit of the good by a consumer will change that of another consumer by exactly one unit. A public good, in contrast, is one where a change in consumption of the good by one consumer will have no impact on the consumption of other consumers.

The third element refers to market trading arrangements. This is not simply a case of deciding between public and private provision. Instead, there may be cases where the possibility of market provision simply does not exist, as, for example with certain environmental assets like clean air and water. For these cases, the matter of the institutional arrangements for provision of a good is predetermined and there is no question of a choice. For other goods, however, this is not so and it would then be

reasonable to talk in terms of choosing institutional arrangements. As seen below, this scenario would almost certainly apply to public parks.

These three elements permit identification of a classification scheme for goods with eight classes, which are described in Table 2.1. The classification differs from the taxonomy suggested by Musgrave (1969) in that he only allowed for rivalry in consumption to alter when characterizing classes of goods. The idea of partial spillovers in consumption which he uses to provide a bridge between pure private and what he calls 'social' goods does, however, represent a scale upon which to place goods along a rivalry/non-rivalry axis. Atkinson and Stiglitz (1980) do something similar by determining the position on the rivalry/non-rivalry axis from the impact changes in consumption of the good have on the consumption possibility frontier for the good. In both these cases no consideration is given to excludability and institutional arrangements as determinants of the type of good. Mitchell and Carson (1989) provide a taxonomy in which excludability and institutional trading arrangements are used, but they ignore the effect of rivalry in determining the class of good. The classification scheme shown here, by allowing for all three elements, provides an arguably clearer picture of the possible types of non-market and market goods.

The categories outlined in Table 2.1 also represent ideal types. This does not preclude the possibility, discussed by Musgrave (1969) and Atkinson and Stiglitz (1980), that rivalry and excludability may be continuous variables. Indeed, they may even be choice variables and not predetermined characteristics irrevocably

Table 2.1: A Classification Scheme for Goods

Name of Good	Description	References
Pure public good	A non-excludable, non-rivalrous good not traded in the market <i>Example:</i> Lighthouses are the standard textbook case, although Coase (1974) pointed out that even this type of good has, in practice, been excludable.	Samuelson (1954) Musgrave (1969)
Subscription good	Goods with non-excludability and non-rivalry characteristics supplied voluntarily in the market. <i>Example:</i> Charities	Bergstrom et al (1986)
Excludable public good	Goods which are non-rivalrous in consumption but for which property rights can be enforced. Local public goods come under this heading, as they are excludable through choice of residence. <i>Example:</i> Museums ^a	Brito and Oakland (1980) Tiebout (1956)
Privatized excludable public good	Goods with the same characteristics as excludable public goods, but where the good is supplied through the market. Club goods are covered by this category. <i>Example:</i> Sports clubs	Gronberg and Hwang (1992) Buchanan (1965)
Quasi-public good	Goods for which it may not be possible for technical or other reasons to exclude users, even though there is rivalry in consumption. <i>Examples:</i> Fisheries, Roads	Tietenberg (1992)
Privatized quasi-public good	A quasi-public good supplied by the private sector . <i>Example:</i> Pigou’s apple orchard	Pigou (1952)
Quasi-private good	Goods which can be supplied by the market but are in fact supplied by the public sector. <i>Example:</i> Education ^b	Kopp and Portney (1985)
Pure private good	The class of good that is normally assumed for analytical purposes in Economics. It has pure excludability and pure rivalry. <i>Example:</i> Butter ^c	Musgrave (1969) Atkinson and Stiglitz (1980)

Notes: ^a As Brito and Oakland (1980) point out, such goods only remain in this category as long as the facility being provided does not become congested. If this happens, they are a quasi-private good ^b Mitchell and Carson (1989) use parks as an example of a quasi-private good in their taxonomy. Bockstael and McConnell (1993) put the household production of services in this non-market category. ^c It is recognized that the consumption of butter could have external effects, but, as with all typologies, the classification simply gives the ideal case.

associated with the good in question. Silva and Kahn (1993) emphasize how excludability can be influenced either by applications of technology to improve the risk of detecting free riders or the use of pricing as a means towards reducing the tendency to free ride. Brito and Oakland (1980) also make this point. In principle, therefore, given the continuities of at least two of the axes, a particular good could be unique in its position within the classification.

There is also a question of whether it is possible to think of trading arrangements on a continuous scale. There are possibilities here, as it is, for example, possible to identify situations falling short of either full public or private provision. Forms of franchising by the public to the private sector and the Private Finance Initiative of the British government may fall into these categories. There remain, however, issues, which cannot be tackled here, as to how these different elements can be scaled to reflect 'degrees of marketness' in the institutional trading arrangements.

For this thesis, the importance of the classification scheme is that in valuing non-market goods the researcher will need to establish, before applying a valuation methodology, whether altering the way the good is provided is preferable to conducting the valuation. This might especially be the case when considering quasi-private goods, where the potential for market provision is probably greatest, but may also be relevant for other goods. The judgement is then whether the previous institutional arrangements were inappropriate and these simply need to be changed. Consideration of the nature of a good thus determines if any attempt at valuation is necessary.

This may suggest that some applications of the CVM may be unnecessary, but that the CVM could, in principle, also be applied across a range of non-market goods currently provided through market mechanisms. The evidence from Bergstrom et al (1986) and Gronberg and Hwang (1992) would suggest that when some goods are supplied through the market the allocation of resources to their production by the market may be socially inefficient. Classifying such goods in the terms presented here would determine if there was a need to evaluate them by non-market means even though they were notionally valued by the market. The potentially huge class of goods where valuation techniques could be applied would make it necessary to adopt a procedure for determining the circumstances in which a good should be evaluated by valuation techniques. Being able to identify where these techniques should be applied would ensure that applications are not determined by relatively random factors such as researcher preference.

In Section 2.4, the question of allocating parks in the classification scheme is addressed to take account of the issues raised here.

2.4 Placing Parks in the Classification of Goods

Parks, it has been seen, are typically provided free to users, yield benefits that go to those who are not necessarily users, and can, in some circumstances, have exclusion technologies applied to them. Taken together, these qualities would seem to suggest that they should be classified as excludable public goods. Parks, however, could be

provided by the private sector and, if this were so, there would be no need for valuation using non-market means. Provision could be transferred to private firms and their value determined by the real WTP of consumers. This would leave no role for the CVM in valuing parks. It is important, therefore, to establish, despite the problems of doing so, the category into which Northampton's parks fall in order to justify use of the CVM.

The first step is to determine the position of parks on the rivalry axis.⁵ Assuming complete excludability and no rivalry in consumption would put them into the category of excludable public good. With rivalry, they are quasi-private goods. This distinction is important, because if the latter is the case then policy makers may feel that there is little point in continuing with public provision of a good that could be supplied through the market: This, in turn, could influence the valuation of the good as transfer from public to private sector can, it has been suggested, reduce a good's value to individuals.⁶ The suggestion for now is that parks are non-rival in consumption, a view based on Musgrave's definition of rivalry. The external benefits they generate for nonusers in the form of environmental benefits imply consumption spillovers that move the good towards the non-rivalry end of the axis.⁷

In determining the extent of excludability, account also needs to be taken of the fact that many parks in Northampton are extremely large and, for this reason, might be considered as non-excludable. To emphasize that this could be a problem for Northampton's parks, in the pilot survey a number of respondents questioned the validity of paying an entrance fee. Their view that it was not realistic to exclude

non-users suggested that they did not accept, other than in the case of one or two of the smaller parks in the town, that parks were excludable in the way that the questions put to them implied.

The question of excludability, however, is complicated by the local nature of parks. Tiebout (1956) provided the original analysis of local public goods whose use was limited to a particular geographical area. These differed, he argued, from public goods supplied by a national jurisdiction which Samuelson (1954) had considered, since it would be possible for people to reveal their preferences about the good by choosing to live in communities where the level of provision was to their liking. This characteristic of locality is important because it means parks are excludable through excessive travel and time costs. A resident of Edinburgh, for example, is effectively excluded from the use of Northampton's parks for this reason.

There are problems with Tiebout, however, as Atkinson and Stiglitz (1980) note. The Pareto-efficient equilibrium he predicted for local public goods would not necessarily result as the non-convexities associated with their production could mean either that no competitive equilibrium would emerge or that there would be non-competitive behaviour on behalf of local governments providing the goods. Either way, Pareto-inefficient allocation would result. These problems, coupled with the possibilities there would be less community types than there are individual preferences and that rich individuals may locate to avoid the impact of redistributive local taxation, have meant that Tiebout's idea that the provision, and implicitly the valuation, of local public goods can be left to some form of market process is not

realistic. Instead, the need for the application of valuation techniques to the field of local public goods remains.

The parks in the town are also provided by the local authority, which places them at the public sector end of any institutional trading arrangements scale. This situation is likely to continue for the foreseeable future. Given that parks are unlikely to exhibit rivalry in consumption, it seems that they fall into the category of excludable public good. If there is rivalry, and they are in the quasi-private good category (the one most likely to raise the question of the appropriate level of provision), the fact of public provision still ensures that valuation would need to be by non-market means. Even the less likely possibility of rivalry in consumption and non-excludability, that would put parks in the quasi-public good category, would still mean that valuation by a technique such as the CVM would be required.

2.5 Concluding Remarks

For reasons given in the previous section, parks would seem to be a form of non-market good that require valuation using a technique like the CVM. As they are most likely to be excludable public goods, this means that they are untypical of goods normally valued by the CVM, which would usually be found in the pure public good category of Table 2.1. As the argument in Section 2.3 suggested, however, this would make their valuation using the CVM part of a wider set of applications of the method. It does not imply that the CVM is inappropriate for their

valuation, but rather that the CVM has not previously been thought of as a method with a broader range of possible applications. One of the aims of this thesis is to extend applications into this broader range.

It is also possible to think of parks as environmental assets, a characteristic of parks which provides further justification for treating them as a good to be valued by the CVM. Although they are a form of man-made environment, they still possess many features seen in what might be termed more natural forms of environmental assets such as beaches, lakes and animal species. To apply the technique to a good with many of the same properties as these natural assets would seem reasonable.

The nature of Northampton's parks as economic goods would appear to imply that they be provided through non-market means and that their value be determined by a technique such as the CVM. This conclusion, however, leads to the question of what is being measured when the value of non-market goods is considered. This question is taken up in Chapter 3.

Notes

1. The term 'new town' is a little misleading as Northampton in the early 1960's, prior to its expansion, had a population of approximately 100,000, but such was the legal description.

2. The pilot and main CV surveys in this thesis actually suggest that the population of Northampton divides into two types of park user along lines corresponding to these two uses.
3. More et al (1996) consider the nature of value more fully in an environmental setting.
4. Welch (1995) provides a further historical example of the external benefits of parks. Victorians were, it appears, keen to provide parks to reduce overcrowding in towns and limit the spread of disease.
5. Rivalry in the consumption of parks could, in fact, potentially influence their value. Some individuals may actually prefer it to exist as they benefit from others using parks at the same time. They may feel safer when they are not the only ones in the park or they may like socializing with other users.
6. The effect works through what Andreoni (1989) has called the “warm glow of giving”. Respondents in CV surveys seem prepared to pay a premium on their own direct benefits, which Andreoni attributes to the benefits associated with feeling good about making a donation to a public provided good. The suggestion is that when the good is provided by the private sector there is no such warm glow and the value placed on the good is, therefore, lower than when the good is supplied by the public sector.
7. As parks are multi-dimensional goods, they can differ in the rivalry they possess depending upon the use to which they are put. Thus, they may be non-rival in consumption for users such as walkers and for non-users who obtain existence and bequest values. For other users, like those living next to a park or attending a special event, parks may be rival in consumption. In the

case of those living in houses overlooking parks, the extent of this rivalry is demonstrated by the price premium placed on houses in such locations. I am grateful to Ken Willis of Newcastle University for this point.

CHAPTER THREE

THE VALUE OF NON-MARKET GOODS: THEORETICAL CONSIDERATIONS

3.1 Introduction

This chapter examines certain theoretical issues that arise when valuing non-market goods using the CVM. They are examined because of their impact on the CV survey design used in this thesis and because they are linked to the nature of parks as goods. More generally, as well, developments in the theory of non-market goods have influenced the development of the CVM. For example, in a famous result Samuelson (1954) established that the optimum level of provision for the pure public good occurs when:

$$\Sigma_i MRS_{ZX} = MRT_{ZX}$$

where MRS_{ZX} is the marginal rate of substitution for i consumers between a public good (Z) and a private good (X) and MRT_{ZX} is the marginal rate of transformation between the two goods.¹

Although this theoretical identification of the equilibrium condition for the provision of a pure public good is a benchmark for government policy, it does not inform the government how to establish consumer preferences for the public good. As Gradstein (1993) notes, public goods may be subject to rent-seeking and free-rider

problems,² which imply difficulties for any government, central or local, in determining the appropriate level of provision of pure public goods. Consumers will lack appropriate incentives to reveal their true preferences for such goods. The CVM, therefore, plays a role in assisting governments to work towards achieving the equilibrium level of public goods.

The case of pure public goods, however, is not, as considered in Chapter 2, the whole story. Instead, they represent, one of a number of non-market goods all of which may need to be valued by a technique like the CVM. Parks, it was shown, could be placed in one of these alternative categories, that of excludable public good. This provided a justification for use of the CVM. The question remains, however, of what value is being measured by the technique when it is applied. In the next section, this is the first of the theoretical issues to be addressed.

3.2 Measures of Value

Theoretically, valuing a non-market good is a standard problem in the measurement of welfare change. It is usually discussed in terms of a pure private good in microeconomic texts, of which Layard and Walters (1978) is a well-known example. In this section the approach, based on Cicchetti and Wilde (1992), Hoehn (1991) and Mitchell and Carson (1989), differs as it is presented in terms of non-market goods. Following Hoehn (1991), it is assumed that the impact of a shift in policy on a non-market good is being valued, where the shift either alters the physical resource

flows emanating from the non-market good or reflects changes in the character of the legal and/or social environment within which the non-market good is provided.

The measurement of welfare change can be illustrated in an analysis which begins with the utility function:

$$U = U(X, Z)$$

where U represents the utility of the consumer, X is a vector of marketed goods and Z is a non-market good.

As is normal, the utility function is strictly increasing in the arguments, continuous and strictly quasi-concave.

Following the dual approach to consumer demand, constrained utility maximization can be represented in terms of the expenditure function:

$$M = M(p, Z, U)$$

where M is the consumer's money income and p is a vector of prices for the marketed goods, X .

One approach to evaluating the benefits of a change in the level of provision of the non-market good is, as Mitchell and Carson (1989) note, to establish the magnitude of the expression:

$$M_0(p_0, Z_0, U_0) - M_1(p_0, Z_1, U_0) = CS$$

in which M_0 and M_1 are the minimum money incomes required to achieve the utility level U_0 with the levels of provision of the non-market good, Z_0 and Z_1 , respectively and CS is the Hicksian compensating surplus measure of benefit.

If M_0 is greater than M_1 , the expression gives the consumer's WTP for the change in the provision of the non-market good. If M_1 exceeds M_0 , this implies a consumer willingness to accept (WTA) a change in money income as compensation for the change in non-market good provision.

The alternative Hicksian equivalent format relies upon estimation of:

$$M_0^*(p_0, Z_0, U_1) - M_1^*(p_0, Z_1, U_1) = ES$$

where M_0^* and M_1^* are the minimum levels of income necessary to achieve the level of utility U_1 and ES is the Hicksian equivalent surplus measure of benefit. In this case, WTP is the amount the consumer is prepared to pay to avoid a policy change making them worse off. WTA represents the amount of compensation the consumer is prepared to receive for not obtaining an increase in the provision of the

non-market good. Table 3.1 summarizes the four main welfare measures. Hoehn (1987), Mitchell and Carson (1989) and Bateman et al (1994) also provide summaries of the different valuation formats.

Table 3.1: Measures of Welfare Change for Non-market Goods

I Compensating surplus (WTP)

$$M_0(p_0, Z_0, U_0) > M_1(p_0, Z_1, U_0)$$

The individual's WTP to effect the change from Z_0 to a higher level of provision of the good, Z_1 . This would normally arise where the good provided benefits for the individual.

II Compensating surplus (WTA)

$$M_1(p_0, Z_1, U_0) > M_0(p_0, Z_0, U_0)$$

The individual requires compensation for the increase in the quantity of the non-market good from Z_0 to Z_1 . This might apply to extra pollution.

III Equivalent surplus (WTP)

$$M_1^*(p_0, Z_1, U_1) > M_0^*(p_0, Z_0, U_1)$$

The individual's WTP to avoid a reduction in provision of the good from Z_0 to Z_1 . This welfare measure was adopted in the CV survey in this thesis.

IV Equivalent surplus (WTA)

$$M_0^*(p_0, Z_0, U_1) > M_1^*(p_0, Z_1, U_1)$$

The individual's WTA compensation for forgoing an increased level of the good's provision from Z_0 to Z_1 .

The format adopted, as is well recognised, depends upon considerations about property right allocations. The compensating format, in determining the amount of money income necessary to maintain an original level of utility, implies an established entitlement to that level of utility. In the equivalent format the assumption is that there will be some movement to a new level of utility, suggesting no entitlement to the original level of utility.

3.3 Measuring the Welfare Change of Park Provision

Whilst the discussion in Section 3.2 relates the situation for a non-market good of the type usually valued using the CVM, parks as a type of good do not fit the standard framework for analyzing the welfare change of a pure public good. They are not, as discussed in Chapter 2, non-excludable, non-rival goods that cannot be supplied in a marketed form. The implications for measuring welfare changes where parks are not supplied through the market, are examined using the approach adopted in Freeman (1993), although amendments are made to highlight the case of parks in Northampton.

To begin with, a representative individual in Northampton has a utility function of the form:

$$U = U(X, Q),$$

where X is a vector of private good quantities such that $X = (x_1, x_2, x_3, x_4, \dots, x_n)$; and Q is a vector of environmental and resource service flows $Q = (q_a, q_p)$, where q_a is an environmental good with a zero price, such as a river, and q_p is the quantity of parks of a fixed amount determined for the individual by the local Council. The utility function is assumed to be strictly increasing, continuous and strictly quasi-concave.

R is a vector of prices for the environmental goods and services (Q), such that $R = (r_a, r_p)$, where r_a equals zero and r_p is the price of parks in the form of the Council Tax paid by Northampton's residents. p is a vector of prices for X . The individual, therefore, maximizes utility subject to the budget constraint:

$$p.X + R.Q = M,$$

where M is the individual's money income. This yields a set of conditional demand functions for the marketed goods of the form:

$$x_i = x_i(p, M - R.Q, Q).$$

The demand function is conditional as the demand for the marketed goods is conditional upon the imposed level of Q , which includes the quantity of parks.

Inserting the conditional demand functions into the utility function gives the conditional indirect utility function:

$$v = v(p, M - R.Q, Q).$$

Making $M - R.Q$ an argument of this expression allows the derivation of a conditional expenditure function (e^*) which is the minimum expenditure necessary on market goods to yield some given level of utility, U_0 , with p and Q given. Thus:

$$e^* = M - R.Q = e^*(p, Q, U_0).$$

In the utility maximization problem faced by this individual consideration must be given to the spending that they are required to make on parks by the Council, R . The individual will, therefore, be faced by a restricted expenditure function (e), where

$$e = e(p, Q, R, U_0),$$

which they will attempt to minimize to achieve the level of utility U_0 .

It follows that:

$$e = e^* + R.Q \quad (3.1)$$

or, total spending is spending on market goods plus spending on environmental goods, in this case, spending on parks.

Welfare measures can now be represented in terms of the two expenditure functions.

The marginal value of a small change in the quantity of either environmental good (w_{qa} or w_{qp}) is given by the derivative of the restricted expenditure function such that:

$$w_{qa} = - \frac{\partial e}{\partial q_a} \quad \text{and} \quad w_{qp} = - \frac{\partial e}{\partial q_p}.$$

The monetary equivalent of the welfare change is, then, the absolute value of the change in expenditure required to achieve the reference level of utility following the change in the level of environmental good provision.

From equation (3.1):

$$w_{qa} = - \frac{\partial e^*}{\partial q_a} - r_a \quad \text{and} \quad w_{qp} = - \frac{\partial e^*}{\partial q_p} - r_p$$

The presence of r in the expression for the marginal value of the welfare change implies that the value of a welfare change is offset for the individual by the requirement to alter spending on the environmental good when r is positive by an amount equal to r , the good's price. Whilst the individual may be made better off following an increase in the quantity of parks, they also have to pay in the form of the higher price, r_p .

The total welfare changes are, as Freeman (1993) states, not compensating and equivalent variation, but compensating and equivalent surplus, since the individual is unable, when faced with fixed quantities of parks, to alter their consumption.

Using the restricted expenditure function implies that the compensating surplus (CS) for a change in the level of provision of parks is:

$$CS = e(p, r_p, q_p^0, q_a, U_0) - e(p, r_p, q_p^1, q_a, U_0) = M - e(p, r_p, q_p^1, q_p, U_0),$$

where q_p^0 is the original level of provision of parks and q_p^1 the altered level of provision.

From the conditional expenditure function it is possible to divide this welfare measure into two components. Using equation (3.1) above:

$$\begin{aligned} CS &= e^*(p, q_p^0, q_a, U_0) + r_p q_p^0 - e^*(p, q_p^1, q_a, U_0) - r_p q_p^1 \\ &= e^*(p, q_p^0, q_a, U_0) - e^*(p, q_p^1, q_a, U_0) - r_p (q_p^1 - q_p^0). \end{aligned}$$

The first two terms in the last expression represent the change in spending on market goods resulting from the change in park provision ($q_p^1 - q_p^0$). This would be the level of the welfare change associated with that change in provision if parks had no price attached to them. As they do have a price in the form of the increased Council Tax implied by an increase in provision, the change in e^* has to be offset by the extra spending the individual must incur on q_p , namely the amount $r(q_p^1 - q_p^0)$. Lankford (1988) calls this the 'income value' of a change in q .

The equivalent surplus (ES) measure of welfare change for a quantity constrained non-market good is given by the expression:

$$\begin{aligned} ES &= e(p, r_p, q_p^0, q_a, U_1) - e(p, r_p, q_p^0, q_a, U_0) \\ &= e(p, r_p, q_p^0, q_a, U_1) - M. \end{aligned}$$

An equivalent expression for ES can be obtained using the conditional expenditure function:

$$\begin{aligned} ES &= e^*(p, q_p^0, q_a, U_1) + r_p q_p^0 - e^*(p, q_p^0, q_a, U_0) - r_p q_p^0 \\ &= e^*(p, q_p^0, q_a, U_1) - e^*(p, q_p^0, q_a, U_0). \end{aligned}$$

The ES measure, therefore, unlike the CS measure, has no ‘income value’ expression to be taken into account, as the level of provision of the priced parks is assumed constant. Instead, this measure depends upon the assumption that the change in utility associated with the change in provision of the environmental good (U_0 to U_1) can be replicated by a change in expenditure on market goods, which is taken to be the change in welfare for the individual. As already discussed, which of these two measures is employed will depend upon the implicit property rights associated with the change being proposed.

3.4 Willingness to Pay and Willingness to Accept

Whichever approach is adopted to measuring welfare change, the choice between WTP and WTA as the basis for determining value, seemed at one time of little concern to those involved with the CVM. This lack of concern originated with Willig (1976) and Randall and Stoll (1980), who appeared to establish that for quantity changes of the type normally assessed by the CVM, there should be little or no difference between WTP and WTA measures of welfare change, unless there were substantial income effects. The latter were thought unlikely for non-market goods. The difficulty with this conclusion, however, proved to be that, in empirical work based on the CVM, values from WTP and WTA formats did differ markedly. Coursey et al (1987), Brookshire and Coursey (1987), Markandya (1988) and Mitchell and Carson (1989) all comment upon this phenomenon. Evidence of such disparities also occurred, as Knetsch and Sinden (1984) showed, in experiments based upon consumption decisions concerning private goods, although Coursey et al (1987) suggested WTA converged upon WTP as the experiment was repeated.

Hanemann (1991) explains the results concerning the disparity between WTP and WTA by showing that it will increase as substitution effects associated with changes in the provision of a good decrease.³ The more substitutes a good has, the smaller will be the difference between the four possible measures of welfare change in Table 3.1. The significance of this theoretical result for the CVM is that non-market goods of the type evaluated by the method are likely to be goods with few substitutes. This would mean that the differences in WTP and WTA measures obtained in CV surveys

are unsurprising. If there are no substitutes then these would be expected to differ.⁴

This result was confirmed experimentally by Shogren et al (1994), although

Adamowicz and Bhardwaj (1993) suggested that even with near perfect substitutes disparities between WTP and WTA persisted.

For now, the question of whether WTP or WTA formats are used in the CVM seems to be settled in favour of the former. Mitchell and Carson (1989), for example, concluded that “a WTP measure is the correct format for valuing decreases in the level of provision of a large class of public goods that were previously thought to require a WTA measure”. Arrow et al (1993), also suggest that the WTP format should be adopted, as it is likely to be the more conservative choice and would, therefore, give a lower bound on any valuation obtained. The more general lesson is that theory in this instance has actually been driven by results obtained by the CVM. Hanemann (1991) suggests that CV surveys may in the past actually have been picking up a phenomenon that theory has only subsequently managed to explain.

3.5 Non-use Values

The final theoretical issue to be reviewed is that of non-use value. Many economists concerned with non-market goods that are environmental services and natural resources identify the possibility that individuals will, apart from any value that they derive from their own use, also obtain values unrelated to their own use, an idea first mooted by Krutilla (1967). As Larson (1992) suggests, changes in the individual's

utility occur with changes in the state of the environment being valued. The total value of a non-market good, therefore, is a combination of use and non-use values. There has been suspicion of this concept amongst some economists, but, as Randall (1992) has pointed out, if non-use values are ignored for environmental assets, then most economic development should logically take place in wilderness areas since it is here that use values are at their lowest.

Difficulties arise in being specific about the nature of non-use values, as agreement on this is not total in the literature, a point noted by More et al (1996). A comparison of Mitchell and Carson (1989), Cicchetti and Wilde (1992) and Aldred (1994), for example, shows that Mitchell and Carson (1989) exclude indirect use benefits and aesthetic values from their typology of existence values (sometimes, but not always used as a synonym for non-use values), whereas Aldred (1994) includes them. To confirm the confusion surrounding terminology, Cicchetti and Wilde (1992) divide non-use values into option and existence values, the former being associated with uncertainty over access to use of the good in the future.⁵

There is a question of whether option value is simply a form of use value, but existence value, the value to the individual of simply knowing that the good exists, does not depend on use. It can arise from a desire to bequeath the good to future generations, from vicarious values, the pleasure from knowing that other individuals can make use of the good both now and in the future and from various forms of altruism. Mitchell and Carson (1989) actually divide existence value into vicarious consumption and stewardship benefits and neatly sidestep the question of whether

option value is a form of use value by the expedient of deriving their typology of value on the assumption, which they recognize as unrealistic, that there is no uncertainty. Against this confused background, Table 3.2 is an attempt to clarify the situation by categorizing the values non-market goods produce in a way that takes account of the concerns raised.

Table 3.2: Values Associated with Non-market Goods

<i>Type of Value</i>	<i>Definition</i>
USE VALUES	
Direct Use	The value of the individual's own consumption of the non-market good. It is the value assumed in most forms of economic analysis.
Indirect Use	The value obtained from the non-market good by its enhancement of other goods and services
Option	The value of knowing that the non-market good will be available for use in the future
EXISTENCE VALUES	
Vicarious use	The value obtained from knowing the non-market good will be available for others to use
Bequest	The value of knowing future generations will be able to use the non-market good
Inherent (or intrinsic or pure)	The value from knowing the non-market good exists and remains undisturbed
Stewardship	The sum of bequest and inherent values
Quasi-option	The value obtained from being able to delay a decision on use of the non-market good until better information is available to make the decision

The significance of non-use value for the CVM is that the method has long been recognized as the only form of non-market good valuation able to pick up this type of value. McConnell (1997) has also recently suggested that different motives for existence value can have an implication for CV survey design in that researchers will need to establish what motivates existence value in a particular case.⁶ This and the question of disaggregating the different components of value are not addressed in this thesis, so matching an approach adopted in studies such as Lake et al (1996).⁷ It is the case, however, that the measure of the value of the parks of Northampton will include an element of some or all of the types of value identified in Table 3.2.

3.6 Theory and Survey Design

This brief theoretical discussion has shown, amongst other things, that in measuring the value of parks it can be difficult to establish what is actually being measured. The theoretical discussion also impinges upon CV survey design in two significant ways.

First, it is important to identify an allocation of property rights relevant to the good under consideration. In this thesis, the appropriate allocation was thought to be one where residents of the town have no *a priori* right to parks, but, instead, must accept the level of provision determined for them by the Council. This may seem an undemocratic view, but arguably reflects the perception of many residents of the town about how such goods are provided. In this light, the choice of property rights

structure meant that the value elicitation format used was effectively determined for the survey.

The other result obtained from the theoretical discussion is that in some respects valuing a good like parks using the CVM is more straightforward than for many environmental goods. Lake et al (1996) make a similar point in their study of a kerbside recycling scheme which shares some of the properties of parks as a good. In such cases, issues to do with substitutes are more easily addressed, since respondents are familiar with the good in question. Again, the survey design reflected this conclusion.

Before turning to the surveys that were conducted in the thesis, the review of the CVM needs to be completed by examining its weaknesses. It has been necessary to extol the method's virtues in justifying its application to the case of parks in Northampton, but it is also important to recognize the method's limitations that are examined in Chapter 4.

Notes

1. Atkinson and Stiglitz (1980) show this condition follows from a government selecting the level of public good provision and allocating the private good to individual households to maximize an individualistic social welfare function.
2. Samuelson (1954) identified the tendency for individuals not to reveal their

true preferences for a public good because they would prefer to free ride, as 'strategic' behaviour. This terminology has entered the CVM literature in the term strategic bias.

3. Substitution effects can also influence valuations in CV surveys. Hoehn (1991) shows that the marginal valuation of a particular non-market good (q_0) depends both upon the effect a change in q_0 has on its own valuation, and upon the effect the change in q_0 can have on the valuation of other non-market goods. Hoehn (1991) and Cummings et al (1994) both tested for how substitution effects affect value and concluded that non-market goods valued by the CVM in isolation are likely to overstate the social valuation of the good if possible substitutes are not brought to the attention of respondents. Concern about the impact of substitution effects led Arrow et al (1993), as mentioned in Table 1.2, to recommend that respondents be reminded of possible substitute commodities in CV surveys. For parks, it was felt that familiarity with the good would mean respondents in the CV survey would be aware of possible substitutes and not require much reminding about them. Respondents were asked about their use of parks and required to identify the parks they had used and the purposes for which they had used them. This, it was felt, represented sufficient recall of the nature of parks as a good to ensure that unwelcome substitution effects would be avoided. Neill (1995) confirms that the degree of reminder of substitutes need not be extensive for the CVM to generate valid results.
4. Other explanations for the discrepancy between WTP and WTA include Vatn and Bromley (1994), who argue that certain goods are endowment goods to

which individuals believe they have an inalienable right. If this is so, then they would have a very low WTP to avoid loss of a good, which they believe to be theirs by right. Similarly, they would expect a very high level of compensation to accept loss of the good. Brookshire and Coursey (1987) ascribe the asymmetry in the two measures to strategic behaviour amongst respondents who will understate their WTP and overstate WTA.

Psychologists also refer to 'loss aversion', whereby individuals will be less willing to forgo something they possess than they will be to obtain something they do not.

5. Option value is that to an individual of guaranteeing a natural resource will be available for future use, something for which the individual is presumed willing to pay. Weisbrod (1964), who first identified the concept, argued that option value would arise in situations of uncertainty when goods were used infrequently, when costs associated with restarting 'production' at some future time would be prohibitively high, or where any such re-commencement would be impossible.
6. McConnell (1997) suggests that existence values motivated by paternalistic altruism, where individuals are only concerned about use of a resource by others, are the only ones that increase total welfare. Existence values due to other altruistic motivations have no effect on value.
7. Attempts have been made to disaggregate the different types of value associated with a particular good. For more on this, see the discussion in Mitchell and Carson (1989).

CHAPTER FOUR

THE CONTINGENT VALUATION METHOD REVISITED

4.1 Introduction

The aims of this thesis identified in Chapter 1 made no mention of testing for the technical weaknesses of the CVM. As the focus of much of the CVM literature is directed at the refinement of the technique to reduce the effect of such weaknesses, it may appear a rather restricted ambition not to offer insights into how technical problems can be resolved. The justification for this approach lies in considering the potential audiences listed in Section 1.1 and, especially, those economists not involved in CV research. This group are significant because their perceptions can strongly influence the regard in which the results produced by the CVM are held. They, more than most, need convincing of the technique's usefulness.

The difficulty is, however, that survey use, upon which the CVM depends, is not well regarded by many economists. Acceptance of the CVM, therefore, will depend upon the extent to which CV researchers can convince other economists of the legitimacy of employing a tool that is viewed with suspicion. As this argument strikes at the heart of the way in which economics is conducted as a subject, this can potentially be very difficult to achieve. Only by practitioners of the CVM showing others in the profession that the CVM can produce valuable results, will the method acquire credibility as a legitimate technique in the portfolio of practising economists.

Weaknesses of the CVM, therefore, arise from its place within the economics profession and not just technical questions. Consequently, this chapter begins by examining why the CV survey in this thesis has been conducted primarily as an application of the method. Attitudes towards survey use, the Achilles heel of the CVM for many economists, are also discussed for how they make it hard for the technique to be accepted in the economics profession. The technical weaknesses of the method, which are further brakes on recognition of the method, are addressed in Sections 4.4 and 4.5.

4.2 Analysis and Application in Economics

The current reputation of economics as a subject, at least for some, is of one unduly fixated on mathematical and technical issues. Debreu (1991), for example, highlights how mathematics is central to discourse in the subject. The mathematical approach can mean that economics is no longer viewed as an applied subject with something to say about policy. Rather, it becomes a set of analytical hoops through which members of the profession must regularly jump.

Against this background, those who feel the process of ‘mathematization’ has gone too far in the subject must show how existing techniques can generate explicit policy suggestions to inform the decisions of policy makers in a way intelligible to a wider audience. In this view, the importance of economics as a subject is as much about finding ways to use existing techniques for the resolution of real problems as about

refining techniques that already exist. As Leontief (1970) emphasized, the nature of structural relationships in the economic system are rapidly changing and economists, therefore, unlike physicists and biologists, require regular new flows of information that must come from new applications. This does not mean that those engaged in the application of techniques ought to ignore the efforts of those pushing forward the boundaries of the subject. Indeed, the application in this thesis is building on work done in the past by others who have adopted a more analytical approach. It does, however, suggest that application can have as important a role as analysis in economics.

The use of the CVM in this thesis is in the spirit of applying the technique to generate policy proposals that might otherwise have been ignored and, in so doing, shows legitimacy of the CVM in the subject of economics. Concentrating on the application of existing techniques can make, as it is hoped the investigation into the value of Northampton's parks demonstrates, a positive contribution to the subject's development by convincing policy makers and the wider population of the value of economics as an applied social science. This is particularly relevant at a time when, as Department of the Environment (1994) indicates, policy makers begin to move towards taking environmental values into account using techniques such as the CVM.

Lawson (1997) has also recently suggested the importance to the profession of stressing the relevance of economics in order to ensure a continued place for the subject in deliberations concerning public policy. This is especially so for the CVM.

Cummings and Harrison (1994) have described how attempting to apply the technique when assessing natural resource damage in the United States has led critics to disparage the technique by likening it to voodoo as a means for forecasting the future. Such views need to be countered.

This emphasis on application rather than analysis does not necessarily sit well with many economists, all the more so when the technique being applied relies upon investigation of what people say they will do in a questionnaire survey, rather than what they might do when certain assumptions are made about their behaviour. The concerns about this issue are such that they require more detailed examination.

4.3 Problems with Questionnaires

Many economists have a distrust of the use of questionnaires of any type in the work of the profession. McCloskey (1985) comments on the way in which “economists are so impressed by the confusions that might possibly arise from questionnaires that they have turned away from them entirely”. In a report conducted into the validity of the CVM, Cambridge Economics Inc (1992) suggested that the method’s usefulness was a “figment of its practitioners’ imagination”. The amount of work that has occurred using the CVM would suggest that McCloskey may have overstated the extent to which all economists have turned away from using questionnaires, but this view probably reflects attitudes in the profession as a whole.

If an explanation for this dismissive attitude towards the use of surveys in economics is sought, it may lie in the influence of Friedman's methodological approach. His reliance on predictionism as the ultimate test of an economic theory has helped to create an atmosphere amongst economists in which ascertaining views of economic actors is considered unimportant. Indeed, Friedman (1953) goes some way to advocating that economists may actually provide 'better' theories when they adopt unrealistic assumptions rather than realistic ones. His work, therefore, has helped to create an intellectual atmosphere within economics that is unsympathetic to those who might wish to apply survey techniques.

Economists influenced by Friedman have also established a method of working which means that, as Mayer (1993) notes, "in their day-to-day work economists are willing to relinquish surface plausibility; indeed the belief that one must dig below surface appearances is what motivates the serious study of economics." Here again, the CVM practitioner's use of surveys is considered inappropriate by many economists, for it involves the acceptance of apparent "surface appearances". Concentrating on what people say they might do rather than on what they actually do, although acknowledged in the CVM literature in the form of hypothetical bias, is an inappropriate way for economists to spend their time, irrespective of the approach's apparent plausibility. The results of a CV survey are undermined because, as Bate (1993) puts it, "there is no cost to being wrong and therefore no incentive to undertake the mental effort to be accurate".

The status of economics as a discipline relative to other social sciences also helps in understanding attitudes towards questionnaire surveys amongst economists.

Friedland and Robertson (1990) have observed that economics claims an intellectual supremacy among the social sciences on the basis that it is more concerned with abstract deductive models than other more empirical social sciences. Being involved in the “noisy and incoherent social world”, to use Friedland and Robertson’s expression, reduces the status of other social sciences, whilst proximity to mathematics raises that of economics. The fear of economists is that this hard-won supremacy would be lost if they were to occupy themselves disproportionately with generating empirical data, as happens in the CVM, and not limit themselves to data manipulation. Lodewijks (1994), too, comments upon economists’ fear of ‘contamination’ from ‘lower-status’ disciplines that can arise when cross-disciplinary work is conducted. The CVM can be such a form of work, as using surveys often requires the involvement of researchers from other disciplines:

These reasons for thinking that those employing the CVM may be viewed suspiciously by other economists puts practitioners of the method on the defensive when its weaknesses are raised. This makes it even more important to show how the CVM can produce worthwhile results in as many situations as possible and redress a possible prejudice against economists amongst policy makers that may have resulted from overemphasis of the analytical side of the subject. The survey reported upon in this thesis is part of that effort to demonstrate to other economists that the method’s reliance on surveys does not represent a threat to the credibility of the subject.

Problems do, of course, arise when the method is used and these need to be

discussed as part of an assessment of the CVM. The discussion in the next two sections considers them.

4.4 Difficulties in the CVM

To begin with, CVM practitioners can find it hard to justify the choice of goods to value, an issue identified by Carson (1997) as a problem. Those not involved in the CVM may fail to appreciate why some non-market goods should be valued but not others. In this context, the very question of what constitutes a non-market good, as discussed in Chapter 2, becomes an awkward one. Whilst the categories of non-rivalry and non-excludability give a framework for identifying which goods should be valued, these characteristics are not necessarily fixed. Silva and Kahn (1993) and Helsley and Strange (1994), for example, suggest that non-excludability is a variable rather than fixed characteristic of a good. Saying that a good has certain qualities that make it suitable for valuation using the CVM is insufficient, therefore. Instead, solidly grounded reasons for valuations using the CVM need to be found if the technique is to have credibility. In the absence of guidance on this issue, individual researcher choice or the imperatives of research funding organizations remain the only determinants of actual valuations conducted and this can give the impression that, certainly at the margin, determining which goods are valued is a random process.

To the extent that little, if any, justification for choosing which goods to value is available, proponents of the CVM will have difficulty in convincing other economists and non-economists that the work of identifying non-market goods of value to society could not just as easily be carried out by political horse-trading. If, as Grant (1993) suggests, economists involved in public policy (which those using the CVM would presumably claim to be) need to learn how to operate politically, this inability to distinguish a suitable framework for identifying those problems with which they are concerned, suggests an inappropriate degree of political ineptitude.

The process of marginalization in the public policy arena can be further exacerbated by the growth of experimentation in economics. Experiments can possess an aura of scientific respectability, mirroring, as they do, an approach familiar in the natural sciences and appealing to the instincts of those economists who support a positivist methodology. They also allow greater control over the parameters of a particular situation being examined than can a CV study. Roth (1988) argues that experimentation can be used for the analysis of appropriate levels of public good provision, so making it a potential competitor to the CVM in the field of public policy, particularly on grounds of cost. The issue of cost for a technique used in public policy is significant, as Larson (1992) and Harrison and Lesley (1996) have observed. Such factors weigh heavily with policy makers making decisions about using the CVM .

Experimental techniques that have developed concrete results in other areas of economic theory may eventually prove politically more acceptable for valuing

non-market goods. It is not surprising, therefore, that in recent times attempts have been made by CV researchers to examine the possibility of employing experimental approaches. Examples of this work include Cummings et al (1995), Frykblom (1997) and Lunander (1998). Smith (1994) also discusses the increasing use of experiments in the CVM.

The issue of survey cost is important for other reasons. As Harrison and Lesley (1996) suggest, there is a danger that only expensive surveys are regarded as valid, when this may not necessarily be the case. The implication is that fewer CV surveys will be conducted when benefits may be had from conducting more. In particular, it may be important to conduct several surveys when assessing WTP over time. Cost may also limit the spread of CV surveys into other applications, especially in the developing world. In circumstances where countries are unable to provide sufficient finance for environmental initiatives, to suppose that resources can be set aside for CV surveys may, to many, seem fanciful. Survey costs may, therefore, undermine the CVM's role in an area likely to be important for its future development.

Challenges to the CVM have been made at more philosophical levels. Vatn and Bromley (1994), for example, have argued that the process of value formation in the collective context associated with non-market goods is far too complex to be captured by the CVM. For them, the whole purpose of the CVM is wrong-headed because the measures derived from application of the method bear little resemblance to how individuals actually value environmental goods. Spash (1997a) too draws attention to how a deontological¹ rights-based approach to life amongst respondents

in a CV survey undermines the utilitarian foundations of the method. If those being questioned are not prepared to accept the trade-offs between the environment and other resources assumed in the CVM then values will be obtained that do not reflect the ethical positions of a sizeable proportion of the population.

Elsewhere, Bromley (1991) has suggested that the primacy of the efficiency principle in decision-making is assumed when the CVM is applied and that the 'objective truth rule' of efficiency in decision-making is adhered to in creating monetary measures for the assessment of non-market goods. This may suggest objectivity in making decisions, but such a claim, Bromley believes, is a false one, since a value judgement about how decisions should be taken is still being made. Efficiency, he argues, is just an economist's view of what should determine the decision-making process and not a universal truth. As Blaug (1992) remarks in another context, "immense confusion has been sown by the pretence that we (economists) can pronounce 'scientifically' on matters of 'efficiency' without committing ourselves to any value judgements". The implication is that the CVM contributes to this confusion by clinging to the notion of a false objectivity.

The notion of an objective realization of value is further attacked by Randall (1993). He proposes a 'meta-methodology' in which techniques are tested against a refutable hypothesis in a crucial experiment, but then argues that the CVM cannot attain the standard of proof required by this approach as those working in the field of the CVM have set themselves the impossible task of identifying values which are never knowable. He argues, therefore, that the hypothesis that the CVM is a reputable

method for welfare change measurement is, in fact, untestable and criticizes advocates of the CVM for preferring appeals to reputation rather than convincing argument when justifying the technique. This creates a situation where a lack of reasonable argument amongst those working with the CVM makes the method seem an unviable proposition to those in the wider “discourse community” who wish to assess its validity for policy purposes.

The CVM has also been criticized for not evaluating a non-market good but, instead, detecting aspects of a respondent’s attitude towards the good. Sagoff (1994) suggests that, in responding to CV surveys, individuals perceive the issues raised by non-market good provision to be dependent upon political, ethical and ideological beliefs that are better mediated through political processes and institutions than the surrogate markets provided in the CVM. Consequently, the consumer preferences identified in a CV survey may be nothing more than expressions of an ethical commitment of the type associated with Sen (1977). As Diamond and Hausman (1993) put it, in a CV survey individuals may be simply saying what they think is the right thing for society and not necessarily the best thing for them personally. In these terms, therefore, a CV survey that attempts to assess the value of a non-market good by requesting monetary valuations may well be identified by potential respondents as morally inappropriate.

Kahneman and Knetsch (1992) take a similar line in arguing that respondents in a CV survey are actually “purchasing moral satisfaction”. Harrison (1992) criticized the idea of moral satisfaction as just another expression of utility and of no value in

determining how individual respondents form their preferences, but if correct it suggests that in valuing goods in a CV survey, in their answers to value elicitation questions respondents are simply expressing general support for classes of goods whether it is the entire class of the good (such as the wildlife in an area) or some subset of the class (a particular animal species).

Schkade and Payne (1994) used the technique of verbal protocol analysis to conclude that the context dependent nature of CV surveys meant that respondents tended to construct their preferences at the time of the survey. The CVM does not, therefore, elicit well-ordered preferences, as is the hope of CV researchers, but simply creates them by putting questions to respondents that they would not otherwise consider. For Diamond and Hausman (1994), the only obvious conclusion is that problems arise in the CVM not from the nature of the methodology but from an absence of fully-formed preferences amongst respondents.

Criticisms of the above type are referred to by McFadden (1994) as fundamental failures of the technique in distinction from the technical failures that derive from weaknesses in application that the method exhibits. The latter type of failure is much discussed in the CV literature and is clearly important, for, as Whitehead et al (1995) suggest, “the merit of using contingent values for policy analysis in large part is determined by their accuracy”. This contrasts with the attitude of Vatn and Bromley (1994), who reflect the view of many on the side of the sceptics when they suggest that practitioners of the CVM are akin to the yachtsman (sic) who produces a series of rather elegant tacking manoeuvres but ends up at a place that he did not wish to

be. Such attacks on the underlying philosophy of the CVM are also consistent with the general professional antipathy of many economists to survey approaches mentioned above.

It is clear that work needs to be done to justify the technique by demonstrating its worth in application, one of the tasks set for this thesis to complete. Before this, however, the technical weaknesses of the technique are related.

4.5 The Biases of the CVM

Use of the CVM can be accompanied by possible ‘biases’² that are summarized in Table 4.1. Bias means that the valuation obtained for a particular non-market good may not reflect the ‘true’ value of the good. This definition, of course, ignores the philosophical question of whether the ‘true’ value of a non-market good is ever knowable, given that it will never be traded in a market. Some ways to minimize the impact of biases on valuations that have been devised by CV researchers are examined in the rest of this section. The discussion gives a flavour of how it is possible to deal with the difficulties researchers face with the issue of bias.

Lazo et al (1992) suggested overcoming problems of information bias by first using verbal protocols and retrospective reports by respondents, to identify the information problems associated with the survey. After redesign, the survey is then presented to another group of individuals who comment on the sort of information they used

Table 4.1: Forms of Bias in the Contingent Valuation Method

<i>Bias^a</i>	<i>Nature of Bias</i>	<i>Reference</i>
Anchor	A more general type of starting point bias. Respondents use more than just an initial bid value to arrive at a valuation of the non-market good.	Kahneman et al (1982)
Bid Design	Sub-optimal experimental design means that inappropriate bid levels are put to respondents in the elicitation format.	Kanninen (1995)
Hypothetical	Respondents are unable to identify the valuation for a good in a situation with which they are not familiar	Bishop and Heberlein (1979)
Information	Respondents cannot properly value the good because they are insufficiently informed about its nature. Relevant information includes information on the good, its complements and substitutes, relative expenditure on other non-market goods, future availability of the good, the behaviour of other consumers, how the good is provided and how payment is collected.	Lazo et al (1992)
Interviewer	Different interviewers can obtain different valuations from similar respondents	Strand and Taraldset (1991)
Mental account	Respondents attribute too much value for a class of goods to a particular good that is part of that class. Also known as the embedding effect	Kahnemann and Knetsch (1992)
Metric	Respondents fail to understand the basis on which the good is being measured. They may interpret the size of the change they are presented with in the CV survey as being either smaller or larger than is the case in reality.	Carson and Mitchell (1995)
Population choice	The characteristics of the population chosen for the CV study do not match that of the population benefiting from the non-market good	Mitchell and Carson (1989)
Probability of provision	Respondents do not believe the good will be provided, despite being told in the survey. This typically occurs when the good is large in scope. Respondents do not believe it can be provided at the stated level	Carson and Mitchell (1995)
Sampling Frame	Each member of the population does not have an equal opportunity of inclusion in the survey	Mitchell and Carson (1989)
Sample Nonresponse	Respondents refuse to participate in the survey (unit non-response) or refuse to answer individual questions in the survey (item non-response). Protest non-response means respondents give a zero response to the value elicitation question because they do not accept such questions as valid.	Lazo et al (1992)

<i>Bias</i>	<i>Nature of Bias</i>	<i>Reference</i>
Sample Selection	Only respondents with an interest in the issue under consideration take part in the survey ^b	Mitchell and Carson (1989)
Sequence aggregation	The aggregation of values across a number of small policy changes may not equal a single valuation of a multidimensional policy. This could occur if a policy is operating in different geographical regions, or where a number of individual policies are components of a national programme.	Hoehn (1991)
Starting point	Respondents' valuation of a good is influenced by the initial bid in an iterative bidding elicitation format. This may reflect a degree of 'yea-saying' by respondents wishing to give interviewers the answers they think are meant to give.	Herriges and Shogren (1996)
Strategic	Respondents attempt to influence an evaluation by not revealing their true valuation for the non-market good. Respondents may overstate their valuation if they valued a change but would not be required to pay for benefits resulting.	Samuelson (1954)
Symbolic	Respondents' answers to a CV survey are determined by the status that a good has as a symbol rather than its actual level of provision. It can occur if a survey considers relatively small changes in the provision of a good. Respondents assume a large change in the good, as a small change would not merit the trouble of a survey, and overstate their value.	Sagoff (1994)
Temporal selection	Values obtained in a survey may not be consistent over time. Also known as inference bias.	Mitchell and Carson (1989)
Vehicle ^c	Respondents give different valuations depending upon the payment mechanism assumed in the survey. Payment vehicles can include local taxation or utility bills depending upon the non-market good under consideration.	Mitchell and Carson (1989)
Welfare choice	Using WTP or WTA measures of welfare change influence the level of the valuation obtained. In practice, the majority of CV surveys adopt the WTP approach, but biases may arise from doing this where theory requires a WTA format be used.	Brookshire and Coursey (1987)

Note: ^a In alphabetical order. ^b Spash (1997a) identifies deontological bias as a special case of sample selectivity bias. Respondents with environmental attitudes are more likely to participate in CV surveys, but, equally, are more likely to possess deontological attitudes which reject the basis of the CVM. This will cause them to register protest bids. ^c In developing countries a unique form of 'payment vehicle bias' can arise. Respondents without access to labour markets and cash incomes may find it implausible being asked the amount they would be prepared to pay in money for a non-market good. Even where they have access to cash income, Boadu (1999) points out, it may not be regular. Asking about money payments, therefore, would create a bias. Swallow and Woudyalew (1994) attempted to compensate for this problem by using labour time as the payment vehicle instead of money.

when answering the questions in the survey. Finally, the whole package is crafted into a compact survey instrument that includes the information necessary for the final sample of respondents to make a valuation of the non-market good without any information bias. When this procedure was followed by Lazo et al (1992), the researchers found that the informed values provided mean valuations that were lower and had smaller variances.

Carson and Mitchell (1995) have argued for an attempt to codify the relationship between different types of goods in order to overcome the problem of defining embedding. In their scheme, they distinguish between goods where nesting effects can be observed and those where there are sequencing effects. Nesting is either quantitative or categorical. Quantitative nesting occurs where a good is a part of some other good in the sense that it can be defined numerically. Thus, one park in Northampton is quantitatively nested in all the parks in the town. Categorical nesting occurs where a good is part of a wider set of complementary goods. For example, one park in Northampton is categorically nested in a good comprising the park and an improved refuse collection service.

Sequencing refers to the effect of respondents being asked to value goods in a different order. This can then affect the valuation placed upon the good by the respondent. Kahneman and Knetsch (1992) argued that this phenomenon meant that the results obtained from a CV survey were, therefore, in essence arbitrary as different results would arise depending upon the sequence in which respondents were asked to value goods. Carson and Mitchell (1995), however, show that,

provided the CV survey is carefully designed, it is possible, using a component sensitivity test, to remove any embedding effects from a study.

Protest responses, which are a source of sample response bias, can also, as Mitchell and Carson (1989) point out, be identified by follow up questions designed to establish the reasons for the zero response or, as in this thesis and Bullock and Kay (1997), be identified before being offered the bid question. These responses are then removed from the survey sample for the purposes of analysis. In some cases, CV researchers remove responses because a bid represents an excessive proportion of the respondent's income, although, as Bateman et al (1994) show, the strategy employed to truncate response data in this way can significantly affect estimates of WTP obtained from the CV survey.

To deal with the problem of non-respondents, Whitehead et al (1993) carried out a survey designed to identify this group. They were able to establish, through a difference in means test, that the socioeconomic characteristics of the respondents and non-respondents in their survey were significantly different. In such circumstances, WTP estimates will be biased to the extent to which the variables that are different influence WTP. Whitehead et al (1993) conclude that CV surveys should attempt to collect data on non-respondents to avoid a possible upward bias in WTP estimates. The collection of such data remains, of course, dependent upon the resources available for any particular CV survey.

As Table 4.1 suggests, a number of biases can also result if the sample upon which a CV survey is based is not well constructed. The tendency amongst CV researchers is to use a probability sample which has statistical properties similar to those of the population. Thus, for example, if 20% of the population are over 45, the aim would be to have a sample that matches this demographic characteristic. If this aim is not achieved, allowance for the failure to match the population characteristics has to be made by weighting the sample characteristics to reflect problems with the weights in the sample.

This problem, however, may not matter for regression analysis. As Cramer (1971) points out, the efficiency of regression coefficients from survey data can be improved by increasing the variability of observations, particularly on variables such as income. This can mean that it is actually preferable to have samples which do not replicate the population characteristics and which include an unrepresentative number of extreme values of variables. Surveys that do this are more appropriate for regression purposes.³

Sampling problems have caused CV researchers to seek alternatives to probability sampling, one of which, as suggested in Section 1.5, is to use convenience samples. Harrison and Lesley (1996) argue that these can give results broadly similar to those from a large and expensive survey but at much lower cost. They suggest using the coefficients from the convenience sample in a valuation function that employed population parameters. They confirmed the efficacy of this approach by using a

convenience sample of students to obtain more or less the same WTP to clean up the Exxon Valdez oil spill as had the well funded CV survey that followed the disaster.⁴

4.6 Concluding Remarks

Table 4.1 provides a list of the large number of biases that have been associated with the CVM. This number raises some important issues. First, in a particular survey, will all the biases be working in the same direction or will they cancel each other out. Second, as Lazo et al (1992) point out, even if a number of adjustments could be made to allow for the biases, will this impose undue costs on researchers. Finally, is it possible to design a survey instrument that allows for all biases, but at the same time does not overwhelm potential respondents with its complexity. For the last question, Arrow et al (1993) have argued that it is possible. Others, like Cambridge Economics Inc (1992), are less sanguine, whilst Harrison (1992) has sought a third way by suggesting that no definitive answer can be given.

In general, the technical problems associated with bias in the CVM are approached on the assumption that researchers have only to solve them and the method will be effective in determining the nature of the preferences individuals have for non-market goods. It must, however, be acknowledged that this remains an open question for proponents of the CVM, as the more profound criticisms of the technique outlined in Section 4.4 would confirm. Further indications of the nature of the debate surrounding the CVM can also be found in the exchange between

Diamond and Hausman (1994) and Portney (1994). Hausman (1993) is also a good source of critical ideas on the whole CVM project.

This conclusion leaves an air of uncertainty surrounding the use of the CVM and calls into question results of CV surveys such as that conducted into the value of Northampton's parks. Nevertheless, armed with knowledge of the limitations of the method, it is possible in the following chapters to examine the results of the two surveys, pilot and main, that were carried out for this thesis.

Notes

1. A deontological position involves making decisions by considering what is right or wrong. In contrast, those adopting the teleological position of neoclassical economics would base decisions on a calculation of the relative costs and benefits of any outcomes. Deontological environmentalism means the individual considers the natural environment to be sacrosanct and means exchanging its loss for potential benefits would be unacceptable. Spash (1997a) has a fuller discussion.
2. A further bias is suggested by Whittington et al (1992). They identify the difficulty in developing countries of respondents having to be interviewed in the presence of others.
3. This result can be seen for a regression of the form:

$$y = \alpha + \beta x + u,$$

where u is the error term and $\text{var}(u) = \sigma^2$.

The variance of the estimated coefficient β is then:

$$\frac{\sigma^2}{n \text{ var}(x)}$$

where n is the sample size.

As the variability of x increases, therefore, so the efficiency of the coefficient estimate improves.

4. Sampling problems can be even more awkward in developing countries where, as Boadu (1992) notes, CV researchers face difficulties in obtaining adequate sampling frames from which a random selection of respondents can be drawn. Inadequate or non-existent census data can make it hard to establish if a sample is representative of a local population.

CHAPTER 5

VALUING NORTHAMPTON'S PUBLIC PARKS: A PILOT SURVEY

5.1 Pilot Survey Design

Randall (1997) has suggested that the main achievement of Arrow et al (1993) was to standardize the approach to the design of CV surveys. The norms set out in Table 1.2 were, therefore, applied as far as possible when drafting the two questionnaires for the pilot survey. Copies of the questionnaires used are given in Appendixes One and Two.

To allow for the theoretical discussion in Chapter 3 and following Arrow et al (1993), the value elicitation questions were based on a WTP format. As highlighted in Chapter 3, the choice of this format in a CV survey is important because of possible discrepancies between WTP and WTA measures of welfare change. That said, the value elicitation format used here may not have been as crucial as in other studies valuing non-market goods, since parks may be a case of a good where there are a number of close substitutes. Such differences come where there are no substitutes for the asset under consideration, as is more usually the case when the CVM is applied. In these circumstances, WTP and WTA would, as Hanemann (1991) suggests, give broadly similar results. Kealy et al (1990) also noted how knowledge of a good would be likely to improve the predictive validity of the CVM,

although they did not confirm that valuing goods which are not pure public goods produces more reliable results.

Also as mentioned in Chapter 3, the hypothetical scenario put to respondents assumed the Borough Council in Northampton to be considering a cut in spending on parks in the town. This cut could take the form of either a reduction in spending on the maintenance of parks or the closure and sale of one of the parks.¹

Respondents were, therefore, asked how much they would be willing to pay to avoid the cut in spending taking place. The scenario was considered likely to strike respondents as realistic when in recent years much discussion of local authority spending has been couched in terms of cuts in its level. Given the implicit assumption that respondents had no property rights to the existing level of park provision, the approach adopted, as described in Chapter 3, elicits the Hicksian equivalent surplus measure of welfare change. Lake et al (1996) point out that such scenarios where respondents are faced with potential losses can overstate WTP because individuals will be unwilling to give up any initial holding of the good. Nevertheless, the requirement to have a realistic scenario prevailed on this occasion.

Two payment vehicles, the Council Tax and an entrance fee, were used in the pilot survey to elicit WTP from respondents. For the Council Tax, WTP represented an annual figure for the change and for the entrance fee the cost per visit. This approach allowed assessment of respondents' reaction to the two different vehicles. Problems with the use of donations as payment vehicles, suggested by Seip and Strand (1992)

and Navrud (1992), meant that the idea of using such a mechanism was discarded.²

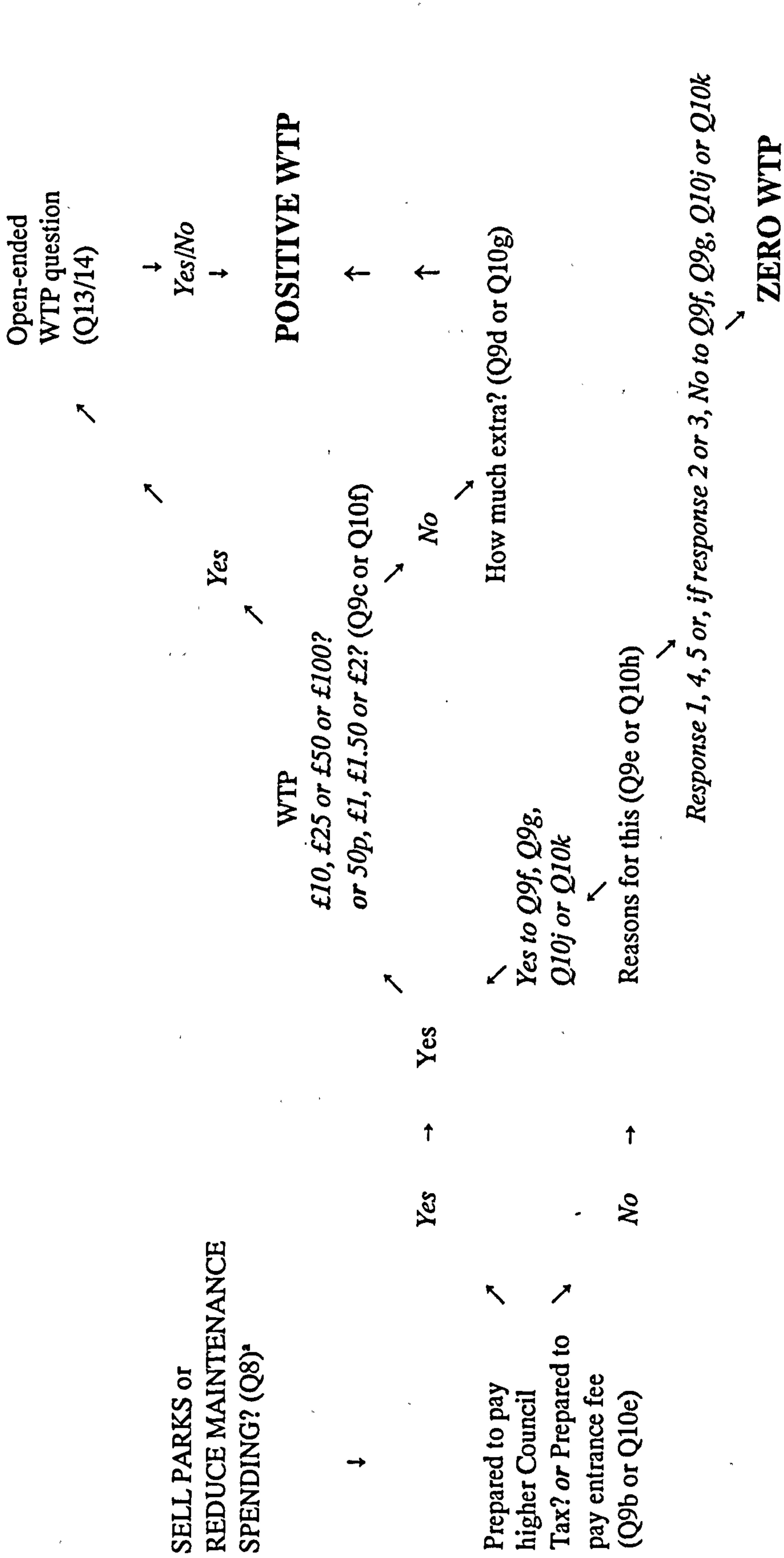
A separate survey instrument was designed for each payment vehicle.

In both cases, a referendum format was, following the advice of Arrow et al (1993), employed for the elicitation question. A schematic representation of the elicitation procedure for the two payment vehicles is given in Figure 5.1.

Referendums are not a regular feature of the United Kingdom's political system at either the local or national level. It might be expected, therefore, that respondents could find this type of question implausible in a setting usually associated with political deals and that this would lead to a high level of item non-response. This, however, did not happen in the pilot survey, nor has it in other CV surveys conducted in the UK. UK respondents seem prepared to accept the notion of being offered a price to 'buy' a particular policy which they can then accept or reject much as they would the price in any economic transaction.

The bid question was 'single-bound' in nature. No follow-up was posed to reflect an initial answer from the respondent. A 'no-answer' option was not included with the bid question, primarily because this could reduce sample size. Ready et al (1995) have also indicated that such an option can give respondents a way to avoid answering the dichotomous choice question in the survey. This may have meant, however, that some responses reflected a desire amongst respondents to provide an answer even if they were not sure of their preferences. Wang (1997) has recently addressed this issue and suggested an estimation procedure to take account of

Figure 5.1: Pilot survey value elicitation format used in valuing Northampton’s parks



Note: * Question numbers on the survey instrument shown in Appendixes One and Two.

‘don’t know responses’. This should ease difficulties in future for researchers working with relatively small sample sizes, as in this pilot.

In accordance with practice in the CVM, general questions about the respondent’s attitudes towards Council services were included to provide a source of variables that could explain the valuation of parks. Responses to these questions also provided data on the nature of the demand for parks in Northampton. Respondents were reminded of their budget constraints by asking them to consider the source of any payment they would make to maintain parks in Northampton. Finally, questions were posed on socio-economic characteristics and the nature of respondents’ use of parks, to provide further explanatory variables for WTP.

The manner in which the survey was conducted is outlined in Section 5.2. In Section 5.3 some descriptive results are provided. Sections 5.4 and 5.5 report the econometric analysis conducted. Section 5.6 considers the lessons learned from the experience of the pilot survey. Policy conclusions that can be derived from the results obtained are given in Section 5.7. Throughout the chapter the main analytical ideas used in the thesis are also introduced.

5.2 Conduct of the Survey

The pilot survey was conducted between February and April 1995 amongst a sample of households taken from the electoral register for the jurisdiction of Northampton Borough Council. Following Arrow et al (1993), respondents were interviewed in

their homes. Questions posed to respondents were read to them from the survey instrument. Where respondents were asked to consider optional responses to a question, these were shown on flash cards, copies of which can be found in Appendix Three. Having only one interviewer, myself, reduced the risk of interviewer bias. All data collected and completed questionnaires are available from me.

A systematic sampling procedure was adopted. Initially, this involved selecting fifteen streets at random from the electoral register in operation from February 1994 to February 1995 for the Borough of Northampton. Streets were taken as the sampling unit to reduce the time costs of travel between locations. Five addresses were then randomly selected from each street, giving 75 addresses in total. This process was subsequently pointed out to bias the sample against residents of Northampton living in streets with a large number of houses³. To offset this effect, the sample was then based on 15% of the addresses in each street, which meant, in practice, that a further 15 addresses were selected from the three longest streets in the initial sample. This yielded the final total sample size of 90 for the pilot survey.

No addresses were contacted outside the borough of Northampton. Loomis (1996) has discussed how determining the extent of the market for a public good can lead to underestimates of the value of the good. Here, however, practical considerations impinged and ruled out the possibility of sampling outside the boundary of Northampton. It is doubtful that the value obtained on this occasion was only 3% of the true value, as Loomis (1996) suggests can happen, but the results obtained do

represent, at the very least, a conservative estimate of the value of parks in Northampton. It could be argued that the extent of this effect depends upon the payment vehicle used since an entrance fee would be payable by all respondents whereas only Northampton's residents would pay the Council Tax. However, it is possible, at least for those living in Northamptonshire, that a tax could be levied on neighbouring councils to reflect the value of Northampton's parks to residents of those councils.

To approach respondents, a letter⁴ was sent to the addresses identified advising that they would be visited during the coming week. In requesting participation in the survey, the letter only referred to views on Council services in general, an approach employed to reduce the possibility that some non-responses would occur if it were known that the main purpose of the survey considering attitudes towards parks. Inevitably, however, the reference to Council services would have deterred some potential respondents from participating in the survey, thereby causing some degree of sample selection bias.

Where occupiers did not wish to participate, and it was judged diplomatic to do so, a further letter⁵ was sent requesting information on the reasons for non-participation and asking if they would reconsider their decision. This approach led to one person changing his mind and agreeing to participate in the survey. No respondents reported that they would not participate in the survey because of its subject matter. More usually the stated reason for non-participation was the intrusion into privacy.

58 completed responses were obtained from the 90 households comprising the sample for the pilot, a sample response rate of 64.4%. This compares favourably with rates reported in Mitchell and Carson (1989) and is remarkably similar to the 63% obtained by Combs et al (1993) in their study of a public park. 29 respondents were presented with each format of the questionnaire.

Item non-responses, failure to answer specific questions in the survey, were low in the pilot. Only three were recorded. All involved the question asking respondents about their household income. Non-responses to the WTP elicitation questions, which Mitchell and Carson (1989) suggest can occur in CV surveys, were non-existent, perhaps because respondents were being asked to value a good with which they are reasonably familiar. Indeed, the survey showed that 87.9% of respondents or members of their household had visited a park at least once during the previous year.

Although the sample was, as described above, determined randomly, some socio-economic characteristics of the sample suggested difficulties with the sampling procedure used. In particular, the sample comprised 62.1% men (36 respondents) and 37.9% women (22 respondents). A test for proportions⁶ gives a z-score of 2.307. The null hypothesis that the proportion of men in the sample was not significantly different from the population proportion, 47.8% as given in the 1991 Census for Northampton, can, therefore, be rejected. There are more men in the sample than would be expected in a random sample. Also, just one respondent was aged between 18 and 24. This value has a z-score of 2.923, which is significant at

the 1% level. Both outcomes were possibly a function of the initial approach for participation in the survey being made by letter to 'the occupier'. In households made up of a number of people, the practice seemed to be that older males would take this form of address to mean them.

These characteristics of the pilot sample mean that the results obtained need to be treated with some caution. The primary purpose of the pilot, however, was to assess the possibility that the CVM could be used to value the parks of Northampton. The response rates achieved to the survey instruments and the specific questions in them were more important, therefore, than the exact nature of the results. The results did indicate, however, how parks were seen by the population of Northampton, which, in turn, suggested how the Borough Council could reconsider their policies on park provision. The results and recommendations are now explored in more detail.

5.3 Results from the Pilot Survey

At the outset, respondents were asked to assess spending on a variety of council services. The results obtained are given in Table 5.1. Although the questions on these issues were primarily intended to ease respondents into the survey, they do reveal that the majority of respondents appeared to consider levels of spending for all services, with the exception of housing, to be 'about right'. For housing, the largest proportion (although not a majority) considered the figure to be 'too little'. The latter result arguably reflects a wider concern amongst people about levels of

Table 5.1: Attitudes to Council Services

<i>Service</i>	<i>Too much spending</i>	<i>Spending about right</i>	<i>Too little spending</i>	<i>Don't know</i>
Highways	9 (15.5) ^a	33 (56.9)	15 (25.9)	1 (1.7)
Parks	2 (3.4)	37 (63.8)	17 (29.3)	2 (3.4)
Refuse Collection	1 (1.7)	44 (75.9)	13 (22.4)	0 (0.0)
Housing	1 (1.7)	20 (34.5)	24 (41.4)	13 (22.4)
Recreation & Tourism	4 (6.9)	33 (56.9)	19 (32.8)	2 (3.4)

Note: ^aThe numbers given are the total number of respondents answering to each level of spending. The numbers in brackets are the percentages.

homelessness, as much as it does a concern about the state of the Council's housing stock. Indeed, many respondents volunteered comments to this effect during interviews. For parks, the figures obtained on the rating of services by respondents were also consistent with the WTP figures expressed in the survey. If 32% of the survey are saying that 'too little' is being spent on parks in the town, this should be reflected in a positive WTP figure. As will be seen, a positive figure was obtained with both payment vehicles.

The picture that emerges is, at least superficially, consistent with that of Tiebout (1956), who argued that individuals express their preferences for local public goods, of which public parks are an example, by locating in those local government jurisdictions where the level of provision best matches their preferences. According to this view, respondents in Northampton could be expected to express themselves

happy with the provision of local public goods. A caveat, however, is hypothetical bias. The results do not necessarily mean that Northampton's residents, if faced with an actual policy of cuts in services to finance a reduction in Council Tax, might not prefer it.

The only area of spending where it was possible to detect any sense that service provision was too high, was that of highways. As Table 5.1 shows, 15.5% of respondents thought 'too much' was being spent on this service, by far the largest percentage of the five areas surveyed. Also, when respondents who thought spending on parks was too little were asked to say how they envisaged extra spending on parks being financed, 26% suggested this could be done by cutting spending on highways. The only other type of spending to be mentioned as a candidate for cuts was that on tourism and recreation, which 10% of those responding thought could be reduced to fund spending on parks.

The survey also provided data, shown in Table 5.2, on the use of parks, which suggested familiarity with the good being valued not typical of CV surveys. As Combs et al (1993) put it, parks are a good that exist in an active and well-defined market. This supports the view that the WTP figures obtained bear some relation to real payments respondents would make if called upon to do so. Lake et al (1996) discuss how valuing a good familiar to the respondent can reduce many of the problems associated with the hypothetical nature of the CVM. Such familiarity can reduce the possibility of information bias or even the risk that the degree of persuasion brought to bear on respondents could, as discussed by Ajzen et al (1996),

Table 5.2: Use of parks by respondents

<i>Number of parks visited</i>	<i>Number of respondents</i>	<i>Percentage</i>
0	7	12.1
1	14	24.1
2	22	37.9
3	8	13.8
4	3	5.2
5	1	1.7
6	1	1.7
7	1	1.7
8	0	0.0
9	1	1.7
<i>Total</i>	58	99.9 ^a

Note: ^a Does not add to 100 due to rounding error.

influence WTP. As Cameron and Englin (1997) have observed, a number of CV studies have investigated how respondent experience of the good is a possible determinant of WTP.

Parks are, of course, also demanded for a variety of purposes and the survey gave ideas on uses in Northampton. Table 5.3 shows for which activities respondents used the parks.

A question to respondents about the feature of the parks most important to them (Q6) also yielded interesting results. 47.1% of the sample thought various facilities provided in the parks, such as the flowers and plants and children’s play areas, were most important. 43.2% simply valued the fact that parks were open spaces offering

Table 5.3: Activities in Northampton's Parks

<i>Activity^a</i>	<i>Percentage of Users^b</i>
Walking	70.6
Picnicking	19.6
Organized Sporting Activity	33.3
Outing with Children	52.9
Enjoying the View	49.0
Special events	74.5
Other ^c	17.6

Notes: ^a These were shown to respondents on a flash card. ^b The percentage of those who used the parks for any activity, namely the 51 respondents identified as users in Table 5.2. ^c These included visiting museums situated in the parks, looking for wildlife and using the parks in connection with employment.

peace and quiet. This would suggest that users of parks in Northampton divide into two roughly equally-sized groups. On the one hand are those who value parks as an environmental amenity and who could be termed ‘open-spacers’ in their demand for parks. On the other are those who value the facilities provided in the parks, the ‘facility-attracted’, whose demand is, arguably, of a different nature. The implication of this difference in perception of the parks in Northampton is examined in Section 5.7.

In response to the question about which policy they would prefer to cut spending on parks, 60.3% of respondents preferred the option to reduce spending on maintenance. Although respondents were not asked about the reasons for their choice in the survey, many volunteered the view that selling a park would have long-term consequences that could not be reversed. A decision to reduce spending on maintenance could conceivably be reversed in the future. Indeed, the number of

respondents preferring the option to reduce spending on maintenance was further increased once they were asked if they would agree to selling a park if the park to be sold was the one nearest to their home. When faced with this scenario, the proportion who preferred the reduced maintenance option rose to 74.1%.

The irreversibility principle may also explain the 76.7% of respondents who would wish to see spending on maintenance reduced by cutting the number of 'free' events in the parks. The alternatives offered, such as a reduction in the maintenance of flowers and plants in parks, could be seen as relatively difficult decisions to reverse. Taken together, the tendency to avoid irreversible decisions may be evidence that the value placed on parks in Northampton includes both inherent and quasi-option value. Further evidence of existence values could be found in responses given to Q7 on why parks should be provided by the Council. 33.6% thought provision would ensure that future generations could use them and 18.2% selected the reason that others might wish to use them. These reasons reflected, respectively, bequest and vicarious use values. Altruism might also be reflected in some of the 15.5% of responses supporting the notion that parks should be supplied so that those on lower incomes can have access to them. Overall, therefore, a majority of respondents reflected some degree of altruism in their demand for parks.

Altruism was not so obvious amongst respondents who expressed a willingness to sell one of the parks in the town. Only one of the 23 who chose this option also agreed to the suggestion to sell the park nearest to their home. Eight, in fact, changed their mind about the idea of selling one of the parks in the town when faced with this

prospect. Altruistic explanations of park provision may not, therefore, be the only ones. Respondents could be just as concerned about their own satisfactions as those of others.

A final aspect of the demand for parks uncovered by the survey was the perception respondents had of parks as a good. Respondents who expressed a WTP for parks were asked to indicate from where in their current household spending they would obtain the money to finance this extra spending. The responses to this question, given in Table 5.4, reveal that the majority of respondents (72.3%) would do this either by cutting spending on entertainment or by using their savings.

A possible conclusion to be drawn from the number of respondents indicating that they would reduce their savings is that extra spending on parks could become available to the Council if this group reduced their savings budgets to allow for increased spending on parks. Alternatively, the responses given to this question, which reminded respondents of their budget constraints, albeit after they had committed themselves to an extra payment, may simply reflect short run inflexibilities in respondents' household budgets. Of the categories put to respondents, the only two which arguably allow any flexibility in spending were those which attracted the majority of responses.

Table 5.4: Source of Payments for Parks

<i>Budget Heading</i>	<i>Number of responses</i>	<i>Percentage of responses</i>
Housing	2	4.3
Food	1	2.1
Energy	2	4.3
Travel	7	14.9
Entertainment	18	38.3
Savings	16	34.0
Other ^a	1	2.1
Total	47 ^b	100.0

Notes: ^a One respondent indicated that he would cut contributions made to charity. ^b The total does not match the number who indicated a positive WTP (38 respondents) as respondents were permitted to indicate more than one category of spending from which they could make the savings to pay for the extra spending on parks.

5.4 The Determinants of Willingness to Pay: a Tobit Analysis

Some econometric analysis was conducted on the pilot survey data using tobit and logit methods. The conclusions drawn cannot be firm as the sample sizes for the two types of elicitation procedure were small. Nonetheless, it shows what it was possible to do with the data and indicates the type of analysis used in the main survey. Their use also helps to determine if the variables which might explain the WTP of respondents for parks in Northampton are consistent with economic theory. If they are, then what Bateman et al (1994) call the theoretical validity of the survey can be established.

The tobit approach lends itself to situations where the dependent variable in the regression is censored, that is, the value is limited at some point. In this case, that value is zero. Respondents cannot, in other words, express a negative value for WTP. A fuller account of the tobit approach is given in Appendix 5.1 to this chapter. Whitehead et al (1995b) and Le Goffe (1995) are examples of the tobit approach being used with CV survey data.

A dependent variable in the tobit approach also needs to be continuous. The significance of this requirement to the pilot survey is that the WTP data could have resulted from respondents engaging in ‘yea-saying’ (saying yes to any initial bid amount with which they were presented) when replying to the elicitation question (Q9c or Q10f). To correct for this, respondents were removed from the sample who had replied yes to the initial bid amount but no to Q13, which asked them to express a higher WTP. It was assumed unlikely that the initial bid value could have exactly determined the respondent’s WTP, as such responses imply. For the purposes of the tobit analysis, therefore, only values of WTP were taken into account where the respondent themselves had actually declared a value for the WTP. In terms of the survey, this meant only the following observations were used in the tobit models:

- a) those respondents who answered no to the initial bid value but then in response to Q9d or Q10g declared a WTP value;
- b) those respondents who answered yes to the initial bid question and then declared a higher WTP in response to Q13 and Q14; and

- c) those respondents who gave a zero value for WTP.

This procedure purported to give a continuous dependent variable of the type required in the tobit approach. It reduced the number of usable observations from 29 to 20 for the Council Tax payment vehicle as the dependent variable and from 29 to 25 when the entrance fee payment vehicle was used.

The independent variables, described in Table 5.5, were based on the socioeconomic data collected during the survey as well as the answers to Q5 about the activities for which respondents used the parks.

The small sample size meant that the number of dummies used on this occasion was restricted. There would have been insufficient degrees of freedom to run a meaningful regression based on all the data available from the survey. The larger sample in the main survey meant more variables, described in Appendix 7.1 to Chapter 7, could be used in the regression. Table 5.6 shows the results for regressions calculated using the data from respondents presented with the Council Tax as a payment vehicle.⁷

In Table 5.6, Model (4) gives the best results from data collected using the Council Tax as the payment vehicle. All explanatory variables in this model are statistically significant at the 10% level or better and it performs best on both the likelihood ratio statistic and the Akaike Information Criterion (AIC)⁸. Three other models are

Table 5.5: Description of independent variables used in estimation of the pilot survey regressions

AGE:	1 = Aged over 40; 0 = otherwise
GENDER	1 = Male; 0 = Female
RESIDENCE:	1 = Resident in Northampton for 5 years or more; 0 = otherwise
OCCUPATION:	1 = Currently in full-time employment; 0 = otherwise
INCOME ^a :	1 = Household income of £15 000 or more per annum; 0 = otherwise
EDUCATION:	1 = Education qualifications above 'A' level; 0 = otherwise
WALKING:	1 = Used the parks for walking; 0 = otherwise
PICNICKING:	1 = Used the parks for picnicking; 0 = otherwise
SPORT:	1 = Used the parks for organized sporting activity; 0 = otherwise
CHILDREN:	1 = Used the parks for outing with children; 0 = otherwise
VIEW:	1 = Used the parks for enjoying the view; 0 = otherwise
EVENTS:	1 = Used the parks for special events; 0 = otherwise

Note: ^a All incomes were self-reported by respondents using the categories presented to them on flash cards. No attempt was made to check the accuracy of these responses.

included in the table to denote the process by which Model (4) was reached. Model (1) incorporates the socioeconomic variables in Table 5.5 as explanatory variables. In this specification only length of residence was statistically significant. Model (2) has the forms of activity for which parks are used as explanatory variables. It was

Table 5.6: Tobit analysis of WTP of respondents for maintaining the current level of public park provision in Northampton - Council Tax as Payment Vehicle

Dependent variable: WTP for maintaining public park provision in Northampton in the form of increased annual Council Tax payments

<i>Independent variables</i>	<i>Model (1)</i>	<i>Model (2)</i>	<i>Model (3)</i>	<i>Model (4)</i>
Constant	-129.59 ^b (69.753) ^d	-34.867 (49.721)	-90.803 ^c (54.906)	-180.37 ^a (55.561)
AGE	11.652 (29.284)			
GENDER	24.094 (31.732)			
RESIDENCE	86.888 ^b (43.442)		77.522 (53.684)	178.63 ^a (58.817)
OCCUPATION	234.72 (2548.6)			89.044 ^a (32.716)
INCOME	-171.88 (2548.6)			
EDUCATION	28.824 (30.333)			-59.798 ^c (31.445)
WALKING		34.123 (38.671)		
PICNICKING		110.05 ^b (50.358)	122.03 ^a (46.412)	176.19 ^a (46.361)
SPORT		83.275 ^b (33.922)	92.020 ^a (33.873)	95.610 ^a (29.042)
CHILDREN		-62.567 (42.225)	-80.440 ^b (43.185)	-180.87 ^a (52.403)
VIEW		-13.988 (36.977)		
EVENTS		-10.407 (32.307)		
SIGMA	52.886 ^a (11.690)	52.842 ^a (12.742)	49.321 ^a (11.753)	37.083 ^a (8.907)
Number of observations:	18	17	17	17
Log-likelihood function:	-62.9060	-58.2816	-57.6665	-54.3493
Likelihood ratio statistic ^e	9.330	7.9996	9.2298 ^c	15.8642 ^b
AIC	7.6562	7.5625	7.2549	7.0999

Notes: ^a Significant at the 1% level. ^b Significant at the 5% level. ^c Significant at the 10% level.

^d Standard errors are given in parentheses. ^e The statistic is based on a comparison between the log-likelihood function of the model reported and that of a model where the coefficients on the explanatory variables are restricted to zero. The latter restricted model is based on the same observations as the unrestricted model.

not possible to include all variables in Models (1) and (2) in the same specification because of the small number of observations.

Use of parks for picnicking and organized sporting activity were statistically significant variables in Model (2). In Model (3), the results from a specification that includes these two variables, the RESIDENCE variable from Model (1) as well as the variable for outings with children are reported. This formed the basis for re-examining the effect of individual socio-economic variables by adding them to the specification in Model (3). By this procedure, the dummy variables for education and being in employment were shown to be statistically significant.

The tobit results can be used to obtain three different figures for mean WTP for parks in Northampton. As Maddala(1983) shows, expectations in the tobit framework take the forms:

$$E(y | y > 0) = X\beta + \sigma \frac{f(z)}{F(z)} \quad (5.1)$$

$$E(y) = X\beta F(z) + \sigma f(z), \quad (5.2)$$

$$E(y^*) = X\beta \quad (5.3)$$

where, $E(.)$ is an expectations operator;

y is the censored dependent variable;

y^* is a latent variable or the potential value of the dependent variable y given the independent variables;

\mathbf{X} is a vector of independent variables in the tobit regression;

β is a vector of coefficients in the tobit regression;

σ is the standard deviation of the error term in the tobit model;

z is equal to $\mathbf{X}\beta/\sigma$;

$F(z)$ is the standard normal cumulative distribution function evaluated at z ;

and $f(z)$ is the standard normal probability density function evaluated at z .

Equation (5.1) is the expected value of the dependent variable conditional on the value of the dependent variable being greater than zero. In this survey, it is the expected value of WTP for those who agreed to make a positive payment, a figure possibly of interest when trying to establish a potential for charging for entry. It would suggest how much on average would be spent by those prepared to pay. Equation (5.2) is the unconditional expectation of the dependent variable or the mean of all observed values both positive and zero. Here this would mean the expected value of WTP that included those who indicated a zero WTP. Finally, equation (5.3) provides the expected value of all potential observations including those of less than zero, the latter, of course, being unobserved. For this survey, this expectation would be the population's mean WTP.

Which form of the expectation should be employed in applied studies can be contentious in the tobit approach, as Maddala (1983) and Greene (1991) both discuss. The demands of this CV study would suggest, however, that equation (5.3) is most appropriate if concern is about the overall WTP of the population of Northampton. Equation (5.2) would be most suitable if it were thought that the

spending on parks were in effect fixed and that only extra contributions could be made to their upkeep. This, in practice, may well be the case, at least in the short run.

These expressions can be applied to Model (4) in Table 5.6. It is normal for the values of the independent variables to be taken at their mean for the purposes of the calculation of $X\beta$. The value of σ is provided by the Limdep software used to estimate the regressions and is reported in Table 5.6. $F(z)$ is available from statistical tables and $f(z)$ can be computed numerically using the expression for the standard normal pdf⁹. Given these sources of the data, the values of the respective identities that make up equations (5.1) to (5.3) are as follows:

$$X\beta = -3.11588; z = -0.08402; F(z) = 0.4681; f(z) = 0.39746; \text{ and } \sigma = 37.083.$$

Placing these into equations (5.1) to (5.3) gives estimates of the mean WTP for the parks of Northampton when the Council Tax payment vehicle is used of:

$$\text{Mean WTP for those indicating a positive value (5.1)} = \text{£}28.37$$

$$\text{Mean WTP for all observations (5.2)} = \text{£}13.28$$

$$\text{Mean WTP for the potential observations (5.3)} = \text{£} -3.12.$$

Whilst mean WTP given by equations (5.1) and (5.2) is positive, there is the problem that the population mean WTP is negative, at least on the basis of the results in Model (4). As Haab and McConnell (1997) suggest, however, such an outcome does not make sense for any form of public good, since it can always be ignored if it does not provide utility to the individual. It is, therefore, more likely that this result reflects a poor econometric specification.

Given the problem of a negative value and that it is common in the tobit setting for heteroscedasticity to arise, this specification issue was tested for in Model (4) using, as suggested by Godfrey (1988), a Lagrange multiplier test. The Lagrange multiplier statistic for the model had a value of 4.5999, which, given that it has a chi-squared distribution with degrees of freedom equal to the number of explanatory variables (in this case, six), means that the null hypothesis of homoscedasticity cannot be rejected.

When a heteroscedastic tobit model was run, however, with a specification for the variance:

$$\sigma^2 = \exp(a'x), \quad (5.4)$$

where a is a vector of coefficients to be estimated and x is a vector of explanatory variables, there was some evidence of heteroscedasticity. Including the variable for occupation in the specification of the variance term, gave a heteroscedastic tobit model shown in Table 5.7.

Table 5.7: Heteroscedastic Tobit model for WTP of respondents for maintaining the current level of public park provision in Northampton - Council Tax as Payment Vehicle

Dependent variable: WTP for maintaining public park provision in Northampton in increased annual Council Tax payments

<i>Independent variables</i>	<i>Coefficients (Heteroscedastic)</i>	<i>Coefficients (Homoscedastic)^f</i>
Constant	-243.70 ^b (123.03) ^d	-180.37 ^a (55.561)
RESIDENCE	192.53 ^a (40.235)	178.63 ^a (58.817)
OCCUPATION	94.606 (119.14)	89.044 ^a (32.716)
EDUCATION	-67.199 ^a (18.744)	-59.798 ^c (31.445)
PICNICKING	207.38 ^a (26.958)	176.19 ^a (46.361)
SPORT	140.72 ^a (17.160)	95.610 ^a (29.042)
CHILDREN	-165.35 ^a (41.780)	-180.87 ^a (52.403)
SIGMA ^e	168.41 (216.50)	37.083 ^a (8.907)
OCCUPATION ^e	-2.4367 ^c (1.3682)	
Number of observations	17	17
Log-likelihood function	-51.5344	-54.3493
Likelihood ratio statistic	21.4940 ^a	15.8642 ^b
AIC	6.8664	7.0999
<i>Estimates of mean WTP (£):</i>		
Equation (5.1)	127.76	28.37
Equation (5.2)	58.28	13.28
Equation (5.3)	-18.59	-3.12

Notes: ^a Significant at the 1% level. ^b Significant at the 5% level. ^c Significant at the 10% level.
^d Standard errors are given in brackets. ^e Estimates for the heteroscedastic term shown in equation (5.4). ^f The coefficients from Model (4) in Table 5.6 are included here for convenience.

The test for the effect of heteroscedasticity in Table 5.7 is carried out using a likelihood ratio test to determine if the value of α in equation (5.4) is zero. As Greene (1991) points out, it is less satisfactory than the Lagrange multiplier test since it requires that the variance in the heteroscedastic model be specified, something not required in the Lagrange multiplier test. The value of the likelihood ratio statistic is obtained, as Greene (1991) shows, by a comparison of the log-likelihood from the two models estimated, namely the homoscedastic tobit model, Model (4) in Table 5.6, and the heteroscedastic model of Table 5.7. The value of this statistic is 5.6298, which exceeds the critical value of 3.84146 when there is one degree of freedom at the 5% significance level. The null hypothesis of homoscedasticity can, on this occasion, be rejected.

In examining the effect of including heteroscedasticity in the tobit model, there are no sign reversals on any of the variables, although coefficient sizes alter. The effect of these changes and the change in the reported value of sigma upon the estimations of mean WTP are also shown in Table 5.7.

Application of the tobit technique to the entrance fee data gave the results in Table 5.8. These were arrived at in a manner similar to that used with the Council Tax data. A different set of significant explanatory variables were obtained, with only education again significant in the best-fitting model, Model (4) in Table 5.8. Even then, the sign is the opposite to that in the earlier specification. Of the other significant variables in Table 5.8, the sign on the coefficient for income suggests

Table 5.8: Tobit Analysis of WTP of respondents for maintaining park provision in Northampton - Entrance Fee as Payment Vehicle

Dependent Variable: WTP for maintaining public park provision in Northampton by paying an entrance fee to the parks

<i>Independent variables</i>	<i>Model (1)</i>	<i>Model (2)</i>	<i>Model (3)</i>	<i>Model (4)</i>
Constant	1.3360 (1.0389) ^d	0.8317 ^c (0.4773)	1.5604 ^b (0.7181)	0.9908 ^a (0.2665)
AGE	-0.2316 (0.4957)			-0.8540 ^a (0.2539)
GENDER	0.1294 (0.4341)			0.7041 ^a (0.2024)
RESIDENCE	-1.1155 ^c (0.6439)		-0.8420 (0.6673)	
OCCUPATION	0.3496 (0.7172)			
INCOME	-0.7229 (0.4914)			-0.7865 ^a (0.2850)
EDUCATION	0.4681 (0.6543)			1.1201 ^a (0.3217)
WALKING		0.0248 (0.3846)		-0.5521 ^b (0.2645)
PICNICKING		-0.0474 (0.4701)		
SPORT		0.1218 (0.4802)		
CHILDREN		-0.1351 (0.3942)		
VIEW		0.9245 ^b (0.3679)	0.9383 ^a (0.3142)	1.3377 ^a (0.2531)
EVENTS		-1.1087 ^a (0.4204)	-1.0604 ^a (0.3645)	-0.5508 ^c (0.2869)
SIGMA		0.6302 ^a (0.1388)	0.6187 ^a (0.1349)	0.3556 ^a (0.0777)
Number of observations:	25	21	21	21
Log-likelihood function:	-26.5228	-17.3274	-16.7294	-9.6836
Likelihood ratio statistic	6.1925	12.7571 ^b	13.9531 ^a	28.0447 ^a
AIC	2.6018	2.2217	1.8790	1.5890

Notes: ^a Significant at the 1% level. ^b Significant at the 5% level. ^c Significant at the 10% level.

^d Standard errors are given in parentheses.

public parks are inferior goods. Here the fact that the coefficient is statistically significant in Model (4) gives more confidence that parks are this type of good.

An explanation for parks being inferior goods could be that they are free at the point of use. In these circumstances, they would be accessible to those on low (or even no) incomes. As income rose, however, users could substitute the inferior alternative (public parks) with a more expensive one. For 'open-spacers' amongst users of the park, this could be a trip to the Peak District. For the 'facility attracted', the alternative might be a location such as Alton Towers. The result is of policy interest in that it suggests the importance of park provision as a redistributive device for local governments.

Mean WTP from the tobit results in Table 5.8 was calculated. On this occasion, the relevant values for the identities in equations (5.1) to (5.3) were:

$$X\beta = -0.54503; z = -1.53252; F(z) = 0.0627; f(z) = 0.12326; \text{ and} \\ \sigma = 0.35564.$$

Substituting into equation (5.1) gives an estimated mean WTP for the entrance fee of £0.1541. Using equation (5.2) the relevant value is £0.00966, or just under one pence per visit and with equation (5.3) the mean WTP would be -£0.5450. The pattern followed by these means, in that they decline in value in moving from equation (5.1) to (5.3), is consistent with the calculations in Tables 5.6 and 5.7.

In testing for heteroscedasticity, the Lagrange multiplier test does not reject the null hypothesis of homoscedasticity. The Lagrange multiplier statistic has a value of 5.6286. When the nature of the variance was specified using equation (5.4) evidence of heteroscedasticity was found. On this occasion, gender was used as the explanatory variable for the variance, although a specification with the level of education included also showed some degree of heteroscedasticity at the 10% level of statistical significance. The heteroscedastic tobit model is reported in Table 5.9. On this occasion, the heteroscedastic specification increases mean WTP, brings their values closer together and removes the negative values for mean WTP.

5.5 The Determinants of Willingness to Pay: a Logit Analysis

In logit analysis of CV data, the main purpose is to examine the responses given to the bid questions put to respondents, the logit technique being, as Buckland et al (1996) put it, a ‘natural way’ to deal with this type of dichotomous dependent variable. Hosmer and Lemeshow (1989) make a similar point about the appropriateness of logit analysis in situations where the dependent variable is dichotomous. The results from the logit method indicate the factors which determine the probability that a positive response to the bid amount will be obtained. A fuller account of the justification for using the technique is given in Appendix 5.2 to this chapter.

Table 5.9: Heteroscedastic Tobit model for WTP of respondents for maintaining the current level of public park provision in Northampton - Entrance Fee as Payment Vehicle

Dependent variable: WTP for maintaining public park provision in Northampton in the form of paying an entrance fee to the parks

<i>Independent variables</i>	<i>Coefficients (Heteroscedastic)</i>	<i>Coefficients (Homoscedastic)^f</i>
Constant	0.87218 (0.60007) ^d	0.9908 ^a (0.2665)
INCOME	-0.63398 (0.62430)	-0.7865 ^a (0.2850)
AGE	-1.2990 (0.89331)	-0.8540 (0.2539) ^a
GENDER	0.79735 (0.78729)	0.7041 ^a (0.2024)
EDUCATION	0.69905 (0.69805)	1.1201 ^a (0.3217)
WALKING	-0.36907 (0.92528)	-0.5521 ^b (0.2645)
VIEW	1.6391 ^b (0.68282)	1.3377 ^a (0.2531)
EVENTS	-0.65417 (0.58236)	-0.5508 ^a (0.2869)
SIGMA ^e	0.08395 ^b (216.50)	0.3556 ^a (0.0777)
GENDER ^e	2.0973 ^a (0.60703)	
Number of observations	21	21
Log-likelihood function	-7.49078	-9.6836
Likelihood ratio statistic	32.4303 ^a	28.0447 ^a
AIC	1.4753	1.5890
<i>Estimates of mean WTP (£):</i>		
Equation (5.1)	0.2226	0.1541
Equation (5.2)	0.2214	0.00966
Equation (5.3)	0.2145	-0.5450

Notes: ^a Significant at the 1% level. ^b Significant at the 5% level. ^c Significant at the 10% level.

^d Standard errors are given in parentheses. ^e Estimates for the heteroscedastic term in equation (5.4).

^f The coefficients from Model (4) in Table 5.8 are included here for convenience.

In the CVM, an important variable for explaining the response to the bid question is the amount of the bid value. This term is, therefore, typically included in the logit regression. The other explanatory variables used in the logit analysis are taken from Table 5.5. The results for the two payment vehicles are reported separately in Tables 5.10 and 5.11.

It is usual, as Buckland et al (1996) show, to investigate the relationship between positive responses to the bid level and the size of the bid level. The *a priori* expectation would be that the sign on this coefficient would be negative, for, as the bid level rises the probability of obtaining a positive response to it will fall. In Model (1) of Table 5.10 the expectation of a negative sign on the bid level variable is fulfilled, but the coefficient is not statistically significant,¹⁰ as the likelihood ratio statistic shows.¹¹ The latter result is confirmed by the value of the t-statistic for the bid variable.¹² Taken together, the usefulness of the results is downgraded, as the coefficient on the bid level in a logit regression is used to derive mean WTP in this estimation procedure¹³.

The relatively poor performance of Model (1) is confirmed by the goodness-of-fit measures reported in the table. Both the pseudo-R² measure¹⁴ and the AIC leave something to be desired.

Following Bateman et al (1995), once the single variable model was derived, it was possible to estimate double variable models where further explanatory variables are added to the bid level in the logit regression. This approach was adopted using the variables in Table 5.5. Of these, only being in employment, as shown in Model (2),

Table 5.10: Logit analysis of pilot survey - Council Tax as payment vehicle

Dependent Variable: A dummy variable with a value of one for a positive response to the bid level put to respondents and a value of zero for a negative response

<i>Independent variables</i>	<i>Model (1)</i>	<i>Model (2)</i>	<i>Model (3)</i>	<i>Model (4)</i>
Constant	1.7352 (1.430) ^d	-0.1144 (-0.066)	-1.3863 (-1.240)	11.511 (0.063)
BID ^e	-0.0246 (-1.287)	-0.0191 (1.563)		
OCCUPATION		1.9802 (1.563)	2.1747 (1.752)	
WALKING				-11.250 (-0.062)
Number of observations	21	21	21	19
Log-likelihood function [ln θ (Ω)]	-13.4404	-11.9968	-12.4394	-10.9651
Restricted log-likelihood [ln θ (ω)]	-14.3411	-14.3411	-14.3411	-12.5041
Likelihood ratio statistic	1.8013	4.6885 ^b	3.8034 ^c	3.0781 ^c
Pseudo-R ² ^f	0.0628	0.1635	0.1326	0.1231
AIC	1.3753	1.3330	1.2799	1.2595
% successful predictions from the model ^g	61.9	66.7	71.4	63.2

Notes: ^a Significant at the 1% level. ^b Significant at the 5% level. ^c Significant at the 10% level
^d t-statistics for individual coefficients are given in brackets. ^e The value of the bid levels put to respondents. ^f This measure of goodness of fit is discussed in note 14 at the end of the chapter. ^g As Judge et al (1988) suggest, the logit model is often used to predict whether or not an event will occur with a given set of explanatory variables. It is, therefore, usual to report the percentage of successful predictions obtained from the particular specification of the model.

proved statistically significant when combined with the bid level. Model (3) suggests that it is the joint significance of these variables that is relevant here, as when the OCCUPATION variable was employed on its own in the logit regression it was not statistically significant. In all cases, the sign on the bid level coefficient remained negative, even though not statistically significant.

Further interpretation of Model (2) is possible. When an explanatory variable is a dummy in a logit regression, as is OCCUPATION here, then it can be interpreted as a maximum likelihood estimate of the natural logarithm of how much more likely it is that a respondent possessing the characteristic will answer positively to the bid question when compared to somebody not possessing that characteristic.¹⁵ As the coefficient on the variable OCCUPATION is 1.9802 in Model (2), this implies that those in employment are 7.244 [$= \exp(1.9802)$] times more likely to respond yes to a given bid level than those not in employment.

Model (4) is included to show the effect of the one other variable (the use of parks for walking) that was statistically significant for this part of the sample when tested for without including the bid level in the regression. As in the tobit models of Tables 5.8 and 5.9, this variable had a negative sign.

The results in Table 5.11, achieved with the same procedures used in compiling Table 5.10, show the sign of the coefficient on the bid level in Model (1) is as expected, but again statistically insignificant.¹⁶ On this occasion, no variable could be combined with the bid level in a statistically significant specification. A further problem was that the bid levels of observations used in Model (1) were nearly all equal to £1. The closeness between the absolute size of the coefficient on the constant term and the bid term in Model (1), as well as their identical standard errors, confirms this.

Table 5.11: Logit analysis of pilot survey - Entrance fee as payment vehicle

Dependent Variable: A dummy variable with a value of one for a positive response to the bid level put to respondents and a value of zero for a negative response

<i>Independent variables</i>	<i>Model (1)</i>	<i>Model (2)</i>	<i>Model (3)</i>	<i>Model (4)</i>
Constant	19.652 (328.52) ^d	-0.3365 (0.5855)	-0.3365 (0.5855)	0.2231 (0.6708)
BID ^c	-19.903 (328.52)			
PICNICKING		-10.866 (156.36)		-12.426 (257.79)
SPORT			-10.866 (156.36)	-12.426 (257.79)
Number of observations	17	15	15	15
Log-likelihood function	-10.9651	-8.1504	-8.1504	-6.1827
Restricted log-likelihood	-11.5174	-9.5477	-9.5477	-9.5477
Likelihood ratio statistic	1.1047	2.7947 ^c	2.7947 ^c	6.7301 ^b
Pseudo-R ²	0.0480	0.1464	0.1464	0.3524
AIC	1.4077	1.2201	1.2201	1.0910
% successful predictions from the model	58.8	66.7	66.7	73.3

Notes: ^a Significant at the 1% level. ^b Significant at the 5% level. ^c Significant at the 10% level
^d t-statistics for individual coefficients are given in brackets. ^e The value of bid levels put to respondents.

Another peculiarity of the results is shown by Models (2) and (3) where the specifications using PICNICKING and SPORT as the explanatory variables generated identical results, although the size of the coefficient makes it highly improbable that those who use the parks either for sport or picnicking would be prepared to say yes to a bid level. $\text{Exp}(-10.866)$ is a very small number. The similarity in the coefficients is, perhaps, unsurprising given the small number of observations involved. They were, however, statistically significant. When the two variables were combined in the specification shown as Model (4) in Table 5.11, they

were jointly significant, although again showing the same values for the coefficients. Model (4), therefore, is the 'best' model attainable from this part of the sample, a result confirmed by the two goodness-of-fit measures, the Pseudo- R^2 statistic and the AIC.

5.6 Problems Encountered and Solutions

Sections 5.4 and 5.5 show that analysis of the pilot survey results produced coefficients on some variables that were statistically significant. This, in turn, gave confidence that the survey was picking up genuine economic phenomena from which policy conclusions could be drawn. These conclusions are examined in Section 5.7, but before considering them the problems faced in conducting the survey are outlined as are some solutions to these problems adopted in the main survey.

The principal problem encountered in administering the survey involved the entrance fee payment vehicle. Although respondents agreed to answer the elicitation question and econometric results were derived from their responses, a number of respondents only gave replies with encouragement and after they had pointed out that it would be very difficult, if not impossible, to block access to the parks to levy the entrance fee. They recognized the importance of exclusion costs in the provision of a good like public parks. The danger, however, was that the hypothetical scenario presented to respondents became unrealistic for them and the possibility of

hypothetical bias occurring was that much greater. These problems did not arise with the Council Tax payment vehicle, although respondents did, in some cases, express the concern that the money raised from the tax would not be allocated to parks alone.

Using two different payment vehicles also meant that econometric analysis of the data could only produce sketchy results because of the small number of observations available and the incompatibility of the two sets of results. Data on the number of visits that a respondent would make to a park during the course of a year would have allowed conversion of an entrance fee WTP into a figure consistent with WTP an increased Council Tax. Even if this had been collected, however, it would be doubtful if the figure on the number of visits would be reliable, as respondents would be called upon to make a very unusual estimate, namely the number of times they would go to a park if they either had to pay an entrance fee or an increased level of Council Tax.

Bias may also have arisen in the data from use of the referendum format in the value elicitation process. Starting point bias is suggested by the way in which many respondents would agree with the amount given to them in the initial elicitation question, but very few altered their WTP when given the opportunity to do so.

The survey also placed demands on research time. Although each interview lasted roughly 20 minutes on average, to this must be added the time taken travelling to and between the different locations, that involved in revisiting addresses where no response was obtained on a first visit as well as time involved in administering the

survey. As a rough approximation, therefore, the total time taken for each completed interview was one hour. The resource cost of the CVM that has been identified elsewhere in the literature, as, for example, in Larson (1992), is highlighted when faced with this level of time commitment. Whilst there were, therefore, benefits from one interviewer alone conducting the survey, it did mean that fewer results were obtained than might have been desirable.

Although time might have been a problem for the researcher, respondents, once any initial suspicion was overcome, did not find the survey excessively long. No respondent attempted to cut short the interview and, in many cases, were willing to discuss the issues beyond the requirements of the survey. Clearly, there are time thresholds for respondents participating in a survey, but, in this case, these did not seem to have been reached.

The trade-off, therefore, is between obtaining more data from each respondent and the time costs of collecting that data. It might also suggest a case for employing survey techniques other than the personal interview. This could, however, reduce the quality of responses, as Arrow et al (1993) indicated, for respondents asked to sit down and give replies to an interviewer may approach the task more carefully than those, for example, completing a postal questionnaire.

Despite the above, the pilot survey did seem to show that the survey instrument used was robust in both formats, although certain changes suggested themselves from the lessons learned in the pilot. These changes were:

- Concentrating on the Council Tax as the payment vehicle for value elicitation;
- Involving other interviewers in the survey process to permit the conduct of more interviews;
- Including questions on respondent involvement in outdoor activities, their interest in environmental issues and the Council Tax band in which their property falls to provide further explanatory variables;
- Including a question on the respondent willingness to pay to restrict access to parks during busy periods (weekends and public holidays) in order to reduce congestion.

As will be seen in Section 6.1, not all these were taken up, but they show how the experience of the pilot survey influenced the final version of the main survey.

5.7 Policy Proposals

The pilot survey was not primarily intended to generate policy results, but it is interesting to consider, before moving on to examine the main survey, policy

conclusions which might follow from the results of the pilot. Even the evidence from the relatively small sample sizes appeared to suggest that Northampton Borough Council could profitably introduce changes in their policies on park provision. The possible changes, discussed below, are summarized in Table 5.12.

The results of the survey suggested that residents of Northampton are generally satisfied with the total level of provision of parks in the town. Thus, selling parks does not seem to be an option. Indeed, park provision in the town could actually be used in a way that may not have been considered previously, as part of social policy. Redistributive effects amongst the town's population arise from the negative sign on the income coefficients shown in the tobit results. Spending on parks, therefore, could be targeted at parks situated close to areas where those with relatively low incomes live.

The division of park users into two groups ('open-spacers' and 'facility-attracted') also has implications for the Council's parks policy. First, it raises the issue of the level of provision for the two target groups. It may appear from the proportions identified that the 'facility-attracted' should receive a higher priority, as they were the larger of the two groups. This could raise questions, however, about the ability of the Council to provide appropriate facilities for this group, as they, unlike the 'open-spacers', would require more finance to meet their demands. The other issue for the Council would be to identify those parks in the town that would satisfy the preferences of the two groups. Care, though, needs to be taken with the suggestion to respond to different user groups. When a dummy variable was created using

Table 5.12: Policy Proposals on Park Provision for Northampton Borough Council

- Consideration of park provision as part of the Council’s social policy
 - Possible provision of two types of park to satisfy the preferences of the ‘open-spacers’ and ‘facility attracted’ park users
 - Identification of the appropriate levels of provision for these two groups and communication of this policy to the residents of Northampton
 - Continuation with the current level of park provision
 - Assessment of the feasibility of the use of entrance fees in at least some parks in the town
-

responses to Q6 that had a value of one for users who were open-spacers and zero for those who were ‘facility attracted’, it was statistically significant for neither payment vehicle in both the tobit and logit analysis.

An implication of responding to different types of user would be that individual parks would no longer be provided with all the elements that traditionally make up a town park. Instead, they could be clearly identified as satisfying one or other of the two groups. Whilst this makes sense in terms of the results presented from the pilot, it would be important to ensure that residents of the town would not be confused by what would be a possible switch in policy. There would, consequently, need to be appropriate communication of this change in policy.

Of the other significant explanatory variables in the econometric approaches employed, it is noticeable that certain uses of the parks encourage a positive WTP. It would be invidious to attempt to identify policy suggestions using the results reported here, as there is no apparent pattern to which of the various uses is significant when the variety of specifications are considered. Nevertheless, the potential importance of this area of the analysis is highlighted by the pilot survey results.

The final issue to emerge from the pilot related to the question of entrance fees and the possibility of introducing such fees for specific parks in the town. Although not identified by survey responses, respondents would characteristically append to any expression of a readiness to pay an entrance fee the qualification that their WTP would only apply to certain parks. Quite often, in fact, one park (Abington) was identified as the only one for which respondents would be prepared to pay to gain entry. As at least parts of this park are easily excludable to non-users, it could be of interest to assess the use of an entrance fee for this particular park. Such an exercise would need both to identify the WTP of respondents and the costs that would be incurred in establishing a sufficiently high level of excludability.

5.8 Feasibility

Clearly, implementation of the above policy changes could only follow a CV survey with a larger sample. The results of the pilot CV survey outlined features of the

demand for Northampton's parks that would be worthy of further consideration in a more extensive investigation. The results obtained also allowed for policy suggestions, the suitability of which could be more confidently asserted if based on a larger study.

In establishing the theoretical validity of the results obtained from the pilot survey through the use of two separate econometric approaches, this application of the CVM showed that use of the technique to value public parks was feasible. The high response rate amongst households approached to participate in the survey and the low level of item non-responses were encouraging signs that the CVM could be applied in the way hoped. In total, the prospect was that a further CV survey, modified by the experience of the pilot, could both value the parks of Northampton and be potentially instrumental in reshaping Council policy. The main CV survey was, therefore, following analysis of the pilot results, designed and then administered. It is to an examination of the results of this survey that the discussion now moves.

Notes

1. Both changes represent reductions in a measure of the quantity of parks. The alternative chosen by respondents did, however, yield extra information on the demand for Northampton's parks.

2. More recent work by Champ et al (1997) suggests this may have been a harsh view and that properly constructed donation mechanisms can produce worthwhile results.
3. I am grateful to Dennis Leech of Warwick University for this point.
4. A copy of the letter sent to respondents is given in Appendix Four.
5. A copy of this letter and the short questionnaire that was attached to it are given in Appendix Five.
6. This relies on the variable (here, males in the sample) having a binomial distribution. For sufficiently large samples, this distribution can be approximated by a normal distribution with a mean of $n\Pi$ and a variance of $n\Pi(1 - \Pi)$, where n is the sample size; and Π is the proportion of the variable in the population.

A z-score is obtained from the sample result when the sample distribution is standardized to a mean of zero and a variance of 1. For a random variable with a value of X , standardization takes place using the expression:

$$z = \frac{X - \mu}{\sigma}$$

where μ is the sample mean and σ is the square root of the sample variance.

The null hypothesis is testing if the sample proportion is significantly different from the population proportion. It is, therefore, a test for sampling bias. As the z-score is normally distributed, using a two-tail test, an absolute value of the z-score greater than 1.96 means the sample result is significant at the 5% level and the null hypothesis can be rejected.

In the calculations in this chapter and Chapter 6, a continuity correction is made on the value of the sample variable. Thus, the z-score calculation must allow for the normal approximation by assuming that the variable is continuous. 36 men, therefore, actually covers all values for the number of men between 35.5 and 36.5. The z-score is calculated using the higher figure.

7. All results reported were calculated using version 7.0 of the LIMDEP program of Greene (1994).
8. The criterion is a measure of goodness of fit designed by Akaike (1973) to allow comparison between the performance of different models on different data sets. It takes account of the precision of the estimate from the data by incorporating the log-likelihood function into the measure and of the parsimony principle by including the number of parameters fitted in the model. It is defined by:

$$AIC = \frac{-2 [\ln \theta (\Omega) - k]}{n}$$

where $\ln \theta (\Omega)$ is the log-likelihood function of the estimated model;

k is the number of fitted parameters in the model; and

n is the number of observations in the model.

The lower the value of the criterion the better the fit of the model.

9. This takes the form:

$$f(x) = [1/\sqrt{(2\pi \sigma^2)}] [\exp(-(x - \mu)^2/(2\sigma^2))],$$

where $x \sim N(0,1)$. Thus, in this formulation $\sigma^2 = 1$ and $\mu = 0$.

10. A specification of the model using the logarithm of the bid level also proved statistically insignificant
11. In logit analysis, the appropriate test of significance of the coefficients on the individual variables is, Hosmer and Lemeshow (1989) identify, a likelihood ratio test. The likelihood ratio test statistic tests the null hypothesis that the explanatory variables concerned (other than the constant term) have no impact on choice probabilities and takes the form:

$$\text{LR test statistic} = 2[\ln \theta (\Omega) - \ln \theta (\omega)]$$

where, $\ln \theta (\Omega)$ is the value of the log-likelihood (LL) function evaluated when the maximum likelihood estimates for the coefficients are used (shown in Table 5.10); and $\ln \theta (\omega)$ is the value of the log-likelihood (LL) function under the hypothesis that the coefficients on the explanatory variables are restricted to zero.

To obtain the latter LL function, a logit specification with only the constant as the explanatory variable is assumed. The value of this function is computed automatically by Limdep.

If the number of coefficients restricted to zero by the null hypothesis is k , then the LR test statistic has an asymptotic chi-square distribution with k degrees of freedom. Thus, the same approach is applied whether testing for the significance of a single coefficient or for the joint significance of a set of coefficients (excluding the constant term). The approach can be generalized to testing sets of linear or non-linear restrictions on coefficients, the only

change being that the degrees of freedom (k) now becomes the number of restrictions under the null hypothesis.

12. t-statistics are not always reliable for testing the significance of individual variables in logit analysis. They are not used, therefore, in subsequent analysis of the significance of variables.
13. If the estimated mean WTP is calculated using the procedure discussed by Buckland et al (1996) (and outlined in detail in Chapter 8), its value in Model (1) is £101.46. When adjusted to allow for the proportion of the sample who replied no to Q9b or Q10e and would not change their minds about this opinion (8 respondents), the value becomes $£[101.46 \cdot (21/29)] = £ 73.47$. The same calculation using the values in Model (2) gives mean WTPs of £93.55 and, adjusted for non-respondents, £67.74. No further analysis was attempted on these models because of the unreliability of the results.
14. The pseudo- R^2 measure of goodness-of-fit is the logit equivalent of the coefficient of determination, R^2 . As Maddala (1983) points out, the R^2 measure is calculated in linear regression models from the expression:

$$R^2 = 1 - [\theta(\omega)/\theta(\Omega)]^{2/n}$$

where n is the number of observations, $\theta(\omega)$ is the restricted likelihood function, and $\theta(\Omega)$ is the unrestricted likelihood function.

Since the likelihood function in the logit model has a maximum value of 1, however, and $\theta(\omega) \leq \theta(\Omega)$, then the upper bound on the expression of R^2 is less than 1 if an R^2 measure is calculated for the logit model. The upper

limit on the value of R^2 is, in fact, $1 - [\theta(\omega)]^{2/n}$ when $\theta(\Omega) = 1$. This property means that using R^2 would not make for a good measure of goodness-of-fit, as even a model that fitted perfectly would have a reported R^2 less than 1.

The pseudo- R^2 measure proposed by McFadden (1974) has this property of a range of values between 0 and 1, making it a suitable measure of goodness-of-fit. It takes the form:

$$\text{pseudo-}R^2 = 1 - \frac{\ln(\theta(\Omega))}{\ln(\theta(\omega))}$$

15. A more rigorous derivation of this result is given in Chapter 8.
16. Mean WTP calculated using Model (1) in Table 5.11 is £0.9874. Adjusted for the respondents not willing to pay any entrance fee the figure becomes $\text{£}[0.9874 \cdot (17/29)] = \text{£}0.5788$. As with mean WTP estimated using Council Tax as the payment vehicle, it would not be wise to dwell on these figures.

APPENDIX 5.1

The Tobit Model

Tobin (1958) developed the model to handle data where the range of values available for the dependent variable was limited. For the CV surveys reported on in this thesis (and often for other forms of microeconomic data), this means that values of WTP are not observed below zero. The sample is said to be censored.

The usual form for presenting the standard tobit model when the dependent variable is censored at zero is:

$$y_i^* = \beta'X_i + e_i \quad (A5.1.1)$$

and $y_i = 0$ if $y_i^* \leq 0$, $y_i = y_i^*$ if $y_i^* > 0$.

where y_i^* is the utility-maximizing value of the dependent variable,

y_i is the observed value of the dependent variable,

β is a $(k \times 1)$ vector of unknown coefficients,

X_i is a $(k \times 1)$ vector of explanatory variables,

e_i are independently and normally distributed residuals that have a mean of zero and a constant variance (σ^2).

For observations where y_i^* is not observed, X_i is still known. This distinguishes the censored regression of the tobit framework from a truncated regression where observations on both the dependent and explanatory variables are unavailable.

Least squares estimation of equation (A5.1.1) will be biased and inconsistent if only observed values of y are used to estimate β . For OLS to be consistent and unbiased would require:

$$\text{either } E(y_i | y_i > 0) = \beta' X_i$$

$$\text{or } E(y_i) = \beta' X_i$$

However:

$$E(y_i | y_i > 0) = \beta' X_i + E(e_i | y_i > 0)$$

$$\text{and } E(e_i | y_i > 0) = E(e_i | e_i > -\beta' X_i) = \sigma \phi_i / \Phi_i \neq 0,$$

where ϕ_i is the standard normal probability density function evaluated at $\beta' X_i / \sigma$ and Φ_i is the standard normal cumulative distribution function evaluated at $\beta' X_i / \sigma$.

These results imply:

$$E(y_i | y_i > 0) = \beta' X_i + \sigma \phi_i / \Phi_i \quad (\text{A5.1.2})$$

In any regression model only using observations for y_i greater than zero:

$$y_i = \beta'X_i + e_i = \beta'X_i + \sigma \phi_i/\Phi_i + u_i,$$

where u_i is an error term.

Using OLS procedures, therefore, will provide estimators which omit the term $\sigma \phi_i/\Phi_i$ and are, consequently, biased and inconsistent.

Also:

$$E(y_i) = P(y_i > 0) * E(y_i | y_i > 0) + P(y_i = 0) * E(y_i | y_i = 0)$$

$$= \Phi_i (\beta'X_i + \sigma \phi_i/\Phi_i) + (1 - \Phi_i)0$$

$$= \Phi_i \beta'X_i + \sigma \phi_i$$

where $P(\cdot)$ is the probability of an event.

Again, using OLS with the available observations gives biased and inconsistent estimators of β .

To overcome this problem, software, such as Limdep, uses maximum likelihood estimation procedures when dependent variables are censored at a lower limit of zero, based on maximization of the log-likelihood function:

$$L = \sum_{y_i = 0} \ln(1 - \Phi_i) - (n_1/2) \ln(2\pi) - (n_1/2) \ln \sigma^2 - \sum_{y_i > 0} (y_i - \beta'X_i)^2 / 2 \sigma^2,$$

where n_1 is the number of observations where $y_i > 0$.

Maximization of this function then takes place through a Newton-Raphson method of iteration. This process, detailed in Maddala (1983), is used in Limdep. Amemiya (1973) showed that such maximum likelihood estimators are consistent and asymptotically normal, whilst noting that they were dependent on the correct specification of the model being used.

Heteroscedasticity in the tobit model can cause the maximum likelihood estimators to be inconsistent, as various authors have shown. The effect of this can be seen in the expression for $E(y_i)$, where if σ now behaves such that $\sigma_i^2 \neq \sigma_j^2$ for observations i and j , then:

$$E(y_i) = \Phi_i \beta'X_i + \sigma_i \phi_i,$$

which is clearly dependent upon the value of σ_i .

Views differ about how to parameterize σ_i^2 , although a common framework is one used by Limdep, namely:

$$\sigma_i^2 = \sigma^2 \exp(a'X_i).$$

The log-likelihood function obtained in the heteroscedastic tobit model is, as Maddala (1983) suggests, dependent upon the specification of σ_i^2 employed.

Note

1. This result can be established by considering the pdf for a standard normal distribution, $z \sim N(0,1)$.

The conditional pdf for z , given that z is greater than some value a , is given by the expression:

$$\phi/P(z>a) = \phi(z)/\Phi(-a)$$

where $\phi(z)$ is the pdf of z ; and

$\Phi(-a)$ is the cdf of z evaluated at $-a$, such that $\Phi(-a) = P(z<-a)$.

Then,

$$\begin{aligned}
E(z | z > a) &= \frac{\int_a^\infty z \phi(z) dz}{\Phi(-a)} = \frac{\int_a^\infty z \exp(-z^2/2) dz}{\Phi(-a) \sqrt{2\pi}} = \frac{\left[-\exp(-z^2/2) \right]_a^\infty}{\Phi(-a) \sqrt{2\pi}} \\
&= \frac{\left[-\phi(z) \right]_a^\infty}{\Phi(-a)} = \frac{\phi(a)}{\Phi(-a)} = \frac{\phi(-a)}{\Phi(-a)}
\end{aligned}$$

Taking the final result and assuming a random variable of the form:

$$y = \mu + \sigma z, \quad y \sim N(\mu, \sigma^2)$$

$$\text{then } E(y | y > b) = \mu + \sigma E(z | z > a) = \mu + \sigma \frac{\phi(-a)}{\Phi(-a)},$$

$$\text{where } a = \frac{b - \mu}{\sigma}.$$

The last expression is equivalent to that in equation (A5.1.2) when $b = 0$ and

$$\mu = \beta' X_i.$$

I am grateful to Dennis Leech for this proof.

APPENDIX 5.2

The Logit Model

A5.1 *The Basic Model*

The model assumes an unobservable response variable defined by the relationship:

$$y_i^* = \beta'X_i + u_i \quad (\text{A5.2.1})$$

where y_i^* is an unobservable latent random variable;

β is a vector of unknown parameters;

X_i is a vector of explanatory variables;

u_i is an error term independently and identically distributed with zero mean and variance σ^2 .

In a CV survey, y_i^* would represent the change in utility associated with the change in provision of the good being valued.

y_i^* may be unobservable, but a dummy variable can be observed that is the outcome of the binary process:

$$y = 1 \text{ if } y_i^* > 0,$$

$$y = 0 \text{ if } y_i^* \leq 0.$$

y_i^* is greater than zero when:

$$U_{i1} > U_{i0}$$

where U_{i1} is the average utility obtained from the choice denoted by subscript 1 and U_{i0} is the utility obtained from the choice denoted by subscript 0.

Cramer (1991) and Judge et al (1988) discuss the random utility basis for the logit model in more detail.

In a CV survey, choice 1 could be acceptance of an option by a respondent where there is increased provision of a good but the individual makes an extra payment for the good. Choice 0 might involve less provision for the individual but a correspondingly lower level of payment.

The probability that y equals 1 is given by the expression:

$$P(y = 1) = P(y_i^* > 0) = P(u_i > -\beta'X_i)$$

$$= 1 - F(-\beta'X_i),$$

where $F(-\beta'X_i)$ is the cdf of the error term, u , evaluated at $-\beta'X_i$, and $P(\cdot)$ is the probability of an event.

Also:

$$P(y=0) = 1 - P(y=1) = F(-\beta'X_i).$$

To determine these probabilities, an assumption about the functional form of the cdf for the error terms is required. In the logit model, this assumption is that the cdf follows a logistic distribution, where the standard form of the logistic distribution's cdf is:

$$F(S) = e^S / (1 + e^S),$$

Thus, in the logit model:

$$P(y=1) = 1 - F(-\beta'X_i) = 1 - \frac{e^{-\beta'X_i}}{(1 + e^{-\beta'X_i})} = \frac{1}{(1 + e^{-\beta'X_i})} = \frac{e^{\beta'X_i}}{(1 + e^{\beta'X_i})}$$

$$\text{and; } P(y=0) = \frac{e^{-\beta'X_i}}{1 + e^{-\beta'X_i}} = \frac{1}{1 + e^{\beta'X_i}}.$$

To obtain an expression that gives a model with a linear relationship between the explanatory variables and the dummy dependent variable, the logit (L or natural logarithm of the odds of an outcome) is taken such that:

$$L = \ln [P(y=1)/ \{1 - P(y=1)\}] = \beta'X_i$$

This transformation gives the logit model where there is a linear relationship between the dependent variable, L , and the explanatory variables, X_i .

As Maddala (1983) shows, maximum likelihood estimates of β can be obtained using the Newton-Raphson method of iteration. Interpretation can then take place in terms of the effect of the explanatory variable on the logit or the event probability.

A5.2 The Logit Model and the CVM

The relationship of this model to results obtained in the CVM with a dichotomous choice format used to elicit values from respondents is shown by Hanemann (1984).

As he suggests, an individual will accept a bid offer when:

$$U(1; Y - A; s) > U(0; Y; s) \quad (A5.2.2)$$

where $U(1; \cdot)$ is an individual's utility for an increased level of provision of a good associated with a bid level;

$U(0; \cdot)$ is the individual's utility function without the extra provision;

Y is the individual's income;

A is the bid level put to the individual in a CV survey;

and; s is a vector of socio-economic characteristics.

As the utility function in equation (A5.2.2) is not observable, the best the CV researcher can do is to consider it as a stochastic random variable. Thus, for the individual respondent, the utility functions in equation (A5.2.2) become:

$$U(1; Y - A; s) = v(1; Y - A; s) + \varepsilon_1 \quad (\text{A5.2.3})$$

$$\text{and; } U(0; Y; s) = v(0; Y; s) + \varepsilon_0, \quad (\text{A5.2.4})$$

where $v(\cdot)$ is the individual's utility function characterized as a random variable, and ε_0 and ε_1 are random variables with means of zero and common variances.

If the utility function is a random variable, any bid put to a respondent in a CV survey will now be accepted when:

$$v(1; Y - A; s) + \varepsilon_1 > v(0; Y; s) + \varepsilon_0.$$

This implies the bid is accepted when:

$$\Delta v > \varepsilon_0 - \varepsilon_1 = \eta,$$

where $\Delta v = v(1; Y - A; s) - v(0; Y; s)$.

The probability distributions for the responses to the bid questions in a CV survey can now be identified as:

$$P(y=1) = P(\Delta v > \eta) = F_{\eta}(\Delta v)$$

where $F_{\eta}(\cdot)$ is the cdf of η .

As in the logit model, the probability of acceptance of a bid is determined from the cdf of an error term (η).

The point now is to identify some functional form for the utility function $v(\cdot)$ to permit the establishment of a welfare measure. Here one of the forms proposed by Hanemann (1984) is discussed, although others can be used. The case examined is that of:

$$v = a_j + \beta Y, \quad j = 0, 1.$$

For this:

$$\Delta v = a_1 + \beta(Y - A) - (a_0 + \beta Y) = (a_1 - a_0) - \beta A$$

$$= \alpha - \beta A.$$

where a_0 and a_1 are the values of these coefficients in the two utility functions given in equations (A5.2.3) and (A5.2.4) and $\alpha = a_1 - a_0$.

Assuming a logistic distribution for the cdf of the error terms (as in the logit model), implies:

$$F_{\eta}(\Delta v) = e^{\Delta v} / (1 + e^{\Delta v}) = e^{\alpha - \beta A} / (1 + e^{\alpha - \beta A}).$$

As shown in Section A5.1, taking a logit transformation of this expression allows estimation of the coefficients, α and β .

It is also the case that:

$$P(y=1) = P(WTP > A).$$

As $P(WTP > A)$ can be expressed as $1 - G(A)$, where $G(\cdot)$ is the cdf of WTP, then:

$$1 - G(A) = F_{\eta}(\Delta v).$$

Estimating the parameters of the logit model with the bid level as an explanatory variable for the dummy response variable is, therefore, as Kriström (1990) points out, equivalent to estimation of the parameters of the cdf of WTP.

The value of an individual's WTP also satisfies the conditions:

$$U(0, Y, s) = U(1, Y - WTP, s);$$

$$\text{and } v(0, Y, s) + \varepsilon_0 = v(1, Y - WTP, s) + \varepsilon_1.$$

These equations indicate that the individual will be as well off without the enhanced environmental provision as with it.

If, as before, v is assumed to equal $a_j + \beta Y$, then:

$$a_0 + \beta Y + \varepsilon_0 = a_1 + \beta(Y - WTP) + \varepsilon_1$$

$$\Rightarrow WTP = \frac{a_1 - a_0 + \eta}{\beta} = \frac{a + \eta}{\beta}$$

The expected value of WTP, $E(WTP)$, is therefore a/β , since $E(\eta) = 0$.

This gives a useful formula for deriving mean WTP from a CV survey where dichotomous choice questions have been used to elicit valuations of the good in question. It shows that estimation of the parameters of a logit model where the bid level is an explanatory variable for the response to the bid question yields an expression for mean WTP. Modifications of this formula are discussed in Chapter 8.

As a word of caution, it is worth noting that the formula for mean WTP presented here is based on assumptions about the distribution of the error terms and the individual's utility function. Changes in these assumptions, as Hanemann (1984) and Cameron (1988) show, lead to different formulae for mean WTP.

Cameron (1988) derives a similar expression for mean WTP. Hers is also based on the parameters of the logit model, but depends upon an assumption that it is the cdf of WTP which takes a logistic distribution rather than the cdf of the error terms. Both, as Kriström (1990) discusses, provide the same formula for mean WTP. Both also show how logit analysis is important in CV studies where values have been elicited from dichotomous choice questions.

CHAPTER SIX

A CONTINGENT VALUATION SURVEY OF NORTHAMPTON'S PARKS

6.1 Changes of Approach

The pilot survey discussed in Chapter 5 provided a foundation for the main CV survey, which is the subject of this and the next two chapters. Experience with it led to recognition that changes would be needed to the survey instrument. The key changes, visible in the copy of the main survey in Appendix Six, were:

1. Using just one payment vehicle, the Council Tax, to elicit respondents' WTP;
2. Including a question to establish respondents' reasons for making a choice between reducing spending on the maintenance of parks and selling one of the town's parks;
3. Requesting respondents' age, as opposed to asking them to identify the category into which their age fell;
4. Including a question on membership of environmental organizations as a proxy for environmental attitudes;

5. Incorporating minor changes to the lay-out of the survey form to make completion by the interviewer easier.

As a larger number of interviews were to be undertaken, the main modification to procedures in the pilot was obtaining help in conducting interviews from an undergraduate student at Nene College¹.

In the next section, administration of the process is discussed. The data collected in the survey are then itemized to indicate how policy implications for Northampton's parks were produced and to meet the requirement of Arrow et al (1993) that data should be fully reported. Reflections on the design of the survey and the nature of the bid design follow prior to a consideration of the socio-economic data in the closing sections.

6.2 Administration of the Survey

The main survey was conducted between December 1995 and June 1996 and, as with the pilot, the advice of Arrow et al (1993) was followed in administering the questionnaire by personal interview in the homes of respondents. 209 interviews were conducted by two interviewers, myself (TC) and Gareth James (GJ). TC conducted 173 interviews and GJ 36. The flash cards used, shown in Appendix

Seven, were slightly amended compared to those used in the pilot. All data and completed questionnaires are available from TC.

The sample was derived similarly to the pilot. Addresses were taken at random from the electoral register of February 1995 for the electoral district of Northampton. The extent to which this gave a sample representative of Northampton's population is examined in Section 6.10. Again, only respondents within the jurisdiction of Northampton Borough Council were interviewed.

414 addresses, distributed across Northampton, made up the sample taken from the electoral register. The 209 completed interviews, therefore, represented a response rate of 50.5%. This compares unfavourably with the 64.4% obtained in the pilot survey, but still remains relatively good for surveys of this type. The two interviewers obtained different response rates, GJ's rate being 35.3% as against 55.4% for TC.

The same method for approaching potential respondents was used as in the pilot, the only difference being amendments to the letter sent before calling to addresses. A different version was also drafted for those addresses to which GJ called. Copies of these letters are in Appendix Eight. As in the pilot, the introductory letters were used to overcome fears respondents may have had in allowing interviewers into their homes. They also reduced the number of fruitless visits, as some recipients would

contact TC to advise that nobody should call. This was a small but helpful reduction in the time costs associated with conducting the survey.

A further change to the administrative arrangements was that the procedure of writing to non-respondents after calling to them was abandoned, as the return on this activity had not been great in the pilot. This does not exclude the possibility, however, that, in future CV surveys, where more resources might be available, this method of increasing the response rate could be adopted.

An estimate of the costs of conducting this CV survey can be made by assuming each interview took one hour. This time included travelling to the interview, visiting addresses where the occupier would not agree to be interviewed, administering letters etc and that taken conducting interviews. Interviews lasted on average approximately 20 minutes. The hourly value of this time to the interviewers could be calculated as $(£25 \times 173/209) + (£5 \times 36/209) = £21.56$, where £25 and £5 represent estimates of the hourly wage rates forgone by the two interviewers TC and GJ respectively. The total time cost of the interviews, therefore, would be $£21.56 \times 209$ hours = £4 505. This figure omits other costs, including direct travel costs, postage, photocopying, computer time etc, but does illustrate that data collection was not costless.

The costs of the interviews also emphasize that the efforts of a sole researcher using the CVM are inevitably constrained and means that the sample size achievable is

substantially lower than in a larger, better-funded exercise. Using personal interviews rather than, say, postal questionnaires, did ensure that the level of involvement of respondents in the process could be more accurately gauged, but the price paid was that fewer residents of Northampton could be approached for their views. Randall (1997) has emphasized how the exacting requirements of the NOAA Panel's recommendations has meant that very few CV surveys can meet the high costs implied. Smith (1994) also refers to the 'barrier to entry' that the guidelines have created in CV research. Experience in this survey would support these views.

With these points in mind, the data gathered are now scrutinised. What follows also acts as a guide to the format of the survey instrument. The results are taken in the order in which questions were posed during the survey interview.

6.3 Parks as a Council Service

Table 6.1 outlines the responses obtained from the opening questions put to respondents about the degree of satisfaction they felt with Council services in the town. A noticeable result is that in only one case is there a statistically significant difference between the proportions obtained in the pilot and sample surveys. In all others the null hypothesis that the sample proportions were identical could not be rejected. This would suggest that the residents of Northampton seem broadly satisfied with the levels of Council provision and that the discussion in Section 5.2

Table 6.1: Attitudes to Council Services in Northampton^a

<i>Service</i>	<i>Too much spending</i>	<i>Spending about right</i>	<i>Too little spending</i>	<i>Don't know</i>
Highways	11.0 ^b (23)	57.9 (121)	29.7 (62)	3.3 (7)
<i>lower 95% CI^c</i>	6.8	51.2	23.5	0.9
<i>upper 95% CI</i>	15.2	64.6	35.9	5.7
Parks	1.0 (2) ^d	66.0 (138)	30.1 (63)	2.9 (6)
<i>lower 95% CI</i>	-0.3	59.6	23.9	0.6
<i>upper 95% CI</i>	2.3	72.4	36.3	5.2
Refuse Collection	0.5 (1) ^d	82.3 (172)	17.2 (36)	0 (0.0)
<i>lower 95% CI</i>	-0.5	77.1	12.1	0.0
<i>upper 95% CI</i>	1.5	87.5	22.3	0.0
Housing	1.4 (3) ^d	34.0 (71)	42.6 (89)	22.0 (46)
<i>lower 95% CI</i>	-0.2	27.6	35.9	16.4
<i>upper 95% CI</i>	3.0	40.4	49.3	27.6
Recreation and Tourism	2.4 (5)	56.5 (118)	28.2 (59)	12.9 (27) ^e
<i>lower 95% CI</i>	0.3	49.8	22.1	8.4
<i>upper 95% CI</i>	4.5	63.2	34.3	17.4

Notes: ^a Table 5.1 contains the comparable data for the pilot survey. ^b Percentage of respondents answering to each level of spending. The number of respondents is in brackets. ^c These are the lower and upper limits of the 95% confidence interval (CI) for the percentage indicating a category of spending. They are calculated from the expression $p \pm 1.96\sqrt{[p(1-p)/n]}$, where p is the proportion choosing the spending option and n is the number in the sample (209). ^d Not significantly different from zero. ^e Significantly different at the 5% level from the proportion obtained in the pilot survey.

remains valid for the main survey. The large percentage of respondents indicating that spending on parks is about right, coupled with those who feel that spending is too low, would also tend to support the notion that there would be a positive WTP for this service, as was the case.

Those respondents who indicated that they felt spending on parks was inappropriate were also asked questions (Q2 and Q3) requiring them to indicate either how they would raise the money to finance the extra spending or how they would dispose of money saved on park spending. Only two respondents fell into the latter category, one of whom wished to increase spending on housing and the other cut Council Tax. 63 respondents wanted to see more spending on parks. Their responses, reported in Table 6.2, suggest that the idea of raising Council Tax as a means for financing extra spending on parks is not what respondents chose to suggest. Indeed, the significant minority of respondents choosing the classification 'other' may have been doing so to avoid having to decide how to pay for the extra spending they had earlier identified as desirable.

6.4 The Nature of Parks

To establish that respondents were aware of the nature of the good being evaluated, questions were posed about park use (Q4 to Q6). Often in CV surveys information on the good is provided directly in the form of text, pictures or spoken information, as for example, in Bullock and Kay (1997). In this case, however, the information was provided indirectly through questions that examined usage. Thus, where respondents indicated that they had not visited a park, they were asked why parks should be provided. Where use was indicated, their response was followed by a question about which parks they had used. For Q4a, 82.3% (172 respondents) said

Table 6.2: How respondents would finance extra spending on parks

<i>Source of Finance</i>	<i>Number</i>	<i>Percentage</i>
Less spending on highways	19	30.2
Less spending on refuse collection	0	0
Less spending on housing	4	6.3
Less spending on Recreation and Tourism	6	9.5
Extra Council Tax	12	19.0
Other ^a	22	34.9
<i>Total</i>	63	99.9 ^b
<i>Should the Council be spending:</i>		
a great deal more?	19	30.2
a little more?	44	69.8
<i>Total</i>	63	100.0

Note: ^aThese included suggestions such as privatization, reducing bureaucracy and sponsoring more events in the parks. ^bDoes not add to 100 due to rounding error.

that they had used parks in the last twelve months, revealing, as in the pilot, a high familiarity with parks. Respondents who seemed uncertain about this question were prompted by reference to the sort of activities that could be undertaken in parks to ensure that they understood what was meant by the notion of ‘the parks in Northampton’. The principal misunderstanding was that respondents mentioned in response to Q4b that they had used a country park. This provided the opportunity, however, to clarify the nature of the good, by indicating that these were not to be considered.

Table 6.3: Recall of Number of Parks Visited

<i>Number of Parks per Respondent^a</i>	<i>Number of Respondents</i>	<i>Percentage of Respondents</i>
0	37	17.7 ^b
1	39	18.7 ^b
2	60	28.7 ^c
3	38	18.2
4	16	7.7
5	8	3.8
6	7	3.3
7	1	0.5 ^b
8	1	0.5
9	2	1.0
<i>Total</i>	209	100.1 ^d

^aThe mean number of parks recalled by respondents was 2.1627. The mode and median both equalled 2. ^bDifferent from the proportion obtained in the pilot survey at the 5% significance level. ^cDifferent from the proportion obtained in the pilot survey at the 1% significance level. ^dDoes not add to 100 due to rounding error.

The results in Table 6.3 helped to assess use intensity amongst respondents and provided a potential explanatory variable with an expectation that WTP would be a positive function of the number of parks used. The difference in rates of usage between the samples in the pilot and main surveys is also demonstrated in the table.

Use of individual parks reported in Table 6.4, yields further points. First, and most obviously, there are a large number of parks in the town of Northampton. The names of 38 different parks are in the table. Second, it reveals a pattern to the use of parks. The number recalling visits to two parks in particular, Abington Park and the

Table 6.4: Parks Recalled by Respondents

<i>Name of Park</i>	<i>Number of Times recalled by Respondents</i>	<i>Percentage^a</i>
Abington	138	31.3
Acre Lane	2	0.5
Becketts	35	8.0
Bedford Road	2	0.5
Bellinge	2	0.5
Briar Hill Rec	1	0.2
College Park	1	0.2
Collingtree	1	0.2
Dallington	15	3.4
Delapre	21	4.8
Delapre Rec	3	0.7
Eastfield	8	1.8
Ecton Brook	4	0.9
Etherington	1	0.2
Far Cotton	6	1.4
Grange	2	0.5
Grangewood	3	0.7
Great Billing	1	0.2
Hunsbury	18	4.1
King's Heath	4	0.9
Kingsthorpe Rec	12	2.7
Lakebridge Drive	1	0.2
Lings	4	0.9
Little Billing	2	0.5
'Local Parks' ^b	8	1.8
Midsummer Meadow	10	2.3
Old Golf Course	1	0.2
Overstone	3	0.7
Penvale	5	1.1
Racecourse	96	21.8
Ransome Road	1	0.2
Rectory Farm	3	0.7
Ryehill	1	0.2
Saint James	3	0.7
Thornton	9	2.0
Victoria	11	2.5
Weston Favell Lakes	1	0.2
Wootton Rec	1	0.2
<i>Totals</i>	440	99.9 ^c

Notes: ^a Percentage of the total number of recalled parks (440). ^b In some cases respondents could not identify by name the local park used. ^c The figure reflects rounding error.

Racecourse, suggests that many town residents use the main town centre parks (these two plus, to a lesser extent, Beckett's) for at least some park visits. This is probably because these parks are used for major events, in particular, the Town Show, held at Abington, and the Balloon Fair held at the Racecourse. The figure of 138 recalling a visit to Abington Park means, in fact, that of those respondents who had used a park, 80.2% had used Abington at least once in the previous twelve months. The equivalent figures for the Racecourse and Beckett's Park are 56.1% and 20.5%. Table 6.4 also indicates that residents will tend, in addition to visiting town centre parks, to use their local park. Thus, the limited use of a large number of the parks recalled reflects their use by just local residents.

Respondents were also asked to identify the most important feature of the parks they used. Again, the options reflected environmental aspects of a park ('Open space' or 'Peace and Quiet') and amenities in the park ('Presence of flowers and plants', 'Children's Play Area' or 'Facilities available'). Table 6.5 gives these results.

The two main types of park users found in the pilot have similar percentages in the main survey. The equivalent figures in the pilot survey were 43.2% for the 'open-spacers' and 47.1% for 'facility-attracted' neither of which are significantly different from those in the main survey when tested for using a t-test. This seems to confirm that users of parks can be divided into two groups with somewhat different requirements and that, in providing parks, acknowledgement needs to be given to the

Table 6.5: Features of parks contributing to personal enjoyment

<i>Feature^a</i>	<i>Percentage of respondents^b</i>
<i>Environmental</i>	
Open Space	28.7
Peace and Quiet	13.5
Total Environmental Users (Open-spacers)	42.2
<i>Amenity</i>	
Presence of flowers and plants	29.8
Children's Play Area	21.1
Facilities Available (e.g.restaurants)	3.5
Total Amenity Users (Facility-attracted)	54.4
Other^c	3.5
TOTAL	100.1^d

^aThe features are those used in the survey question. ^bPercentage of the 171 respondents who had indicated they had used the parks. ^cThese included features such as lakes, the wildlife and the quality of the sports pitches. ^d Does not add to 100 due to rounding error.

possibility of meeting the preferences of the two different groups by providing different types of parks.

6.5 Considering Others

Respondents might not necessarily only be concerned with their own use. Q7 was included in the survey to ascertain why people thought parks ought to be provided. A theoretical reason for this question was to determine if there was evidence of non-use value for parks amongst the residents of Northampton. Responses could also be a measure of the extent to which altruism underpinned the desire of Northampton residents to see parks provided, although answers obtained from such questions are notoriously open to the criticism that respondents do not express motives that benefit themselves for fear of being thought selfish.

Respondents chose up to two reasons for providing parks from a list. This allowed them to combine reasons if they wished or to choose just one reason giving in total sixteen possible combinations of response to this question. A 'no reason' option was also available and was chosen by 0.43% of respondents.

Table 6.6 implies respondents seemed reluctant to give an entirely selfish motivation for supporting the provision of parks. Only 4.33% of respondents chose to identify their own use as the sole reason for supporting park provision. Reasons given by respondents who did not use parks were also of interest, as the responses of this group say something about possible non-use values. Their responses², given in the second column of Table 6.6, suggest that the vast majority of this group did not see their own use as a reason for park provision. Instead, with the exception of five

Table 6.6: Reasons for Providing Parks

<i>Combinations of Reasons</i>	<i>Percentage of all respondents</i>	<i>Percentage of non-users^a</i>
7.1 ^c only	4.3 (9) ^b	0 (0)
7.1 plus 7.2	5.3 (11)	0 (0)
7.1 plus 7.3	4.8 (10)	0 (0)
7.1 plus 7.4	7.7 (16)	2.7 (1)
7.1 plus 7.5	4.8 (10)	2.7 (1)
7.2 only	1.0 (2)	2.7 (1)
7.2 plus 7.3	5.3 (11)	18.9 (7)
7.2 plus 7.4	14.0 (29)	16.2 (6)
7.2 plus 7.5	14.5 (30)	10.8 (4)
7.3 only	2.4 (5)	5.4 (2)
7.3 plus 7.4	7.7 (16)	5.4 (2)
7.3 plus 7.5	8.2 (17)	2.7 (1)
7.4 only	1.9 (4)	2.7 (1)
7.4 plus 7.5	12.6 (26)	16.2 (6)
7.5 only	2.9 (6)	0 (0)
7.6	2.4 (5)	13.5 (5)
<i>Totals</i>	99.8 ^d	100 (37)
Key for Reasons:	Own use (7.1) Other people's use (7.2) Environment will be cleaner (7.3) Future generations will use (7.4) Use of those on lower incomes (7.5) No reason (7.6)	

Note: ^aPercentage of those answering no to Q4. ^bNumber of respondents choosing each option are given in brackets. ^cCodes used on the survey instrument. ^dDoes not add to 100 due to rounding error.

respondents who chose the ‘no reason’ option, non-users placed more emphasis on parks being provided for the use of all. In contrast, the entire sample was more

inclined to emphasize the use of those on lower incomes as a reason for providing parks. Additionally, non-users stress environmental concerns more, particularly in association with concern for the use of others. The value that non-users place on parks, therefore, arises from different reasons, but still seems to be positive.

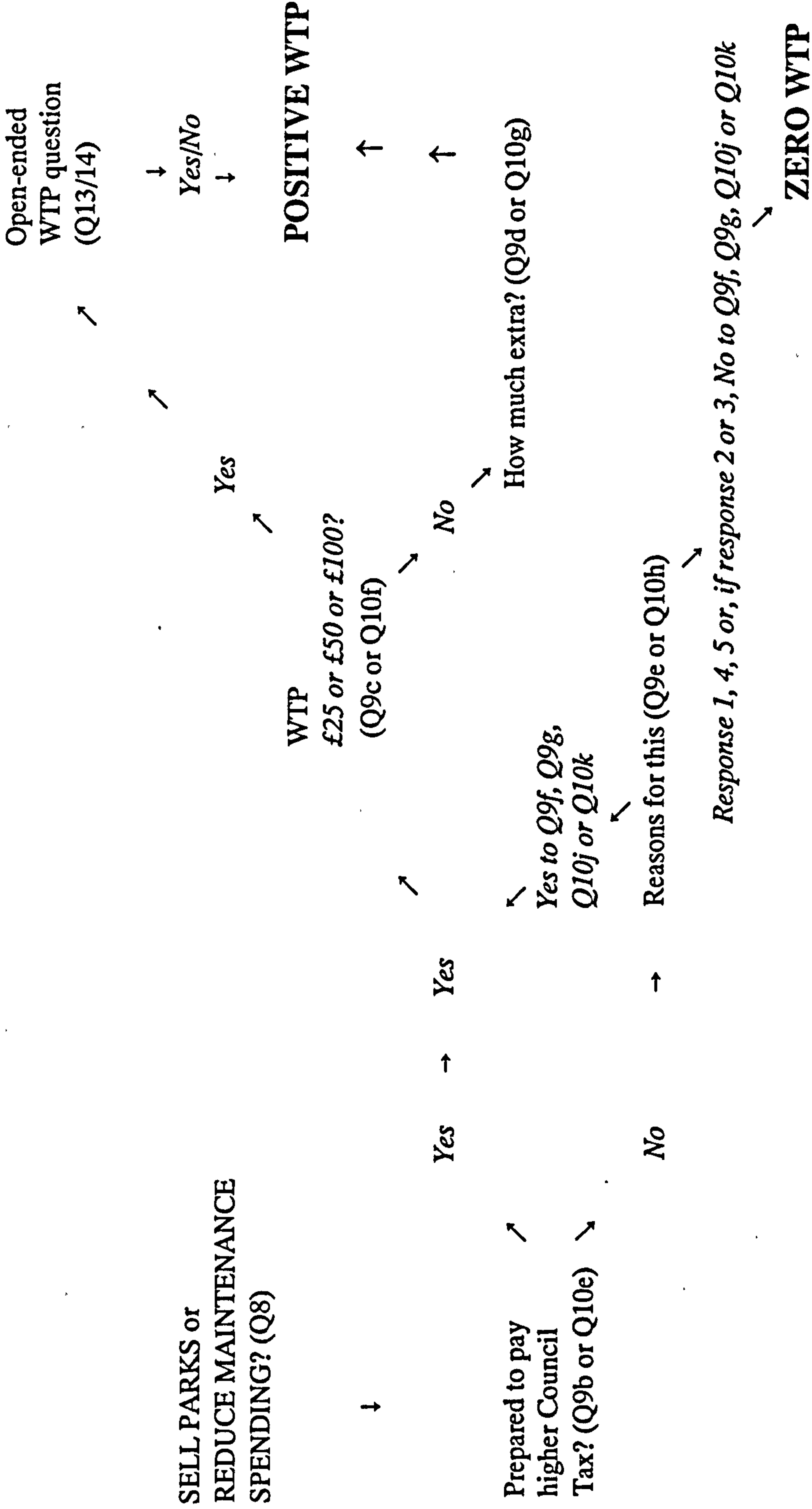
6.6 The Hypothetical Scenario: Cutting Maintenance or Selling a Park?

The hypothetical scenario in the value elicitation procedure was the same as in the pilot. Respondents were again asked how they would wish spending on parks in the town to be reduced if the Council were considering this as a policy option. This permitted measurement of a Hicksian equivalent surplus measure of welfare change.

Figure 6.1 depicts the value elicitation procedure for the main survey.

65.6% of respondents (137) initially chose reduction of spending on the maintenance of parks, with the remainder choosing the option to sell one of the parks. Even amongst respondents whose stated WTP was zero and who might, therefore, be thought more inclined to accept the idea of selling a park, the majority (56.9%) preferred to reduce maintenance rather than sell a park. Of those who chose the option to sell, 19 changed their mind when it was put to them that the park to be sold might be the one closest to their home. Eventually, therefore, 156 chose to reduce maintenance and 53 to sell a park.

Figure 6.1: A schematic representation of the value elicitation format used in valuing Northampton’s parks



Reasons for the choices made were sought, although it was not possible to present the same set of reasons to both groups of respondents. The nature of the choices involved meant that sensible reasons for one response were not for the other. Those electing to reduce maintenance spending were asked to choose between an option that expressed concern for the future (altruistic), one that identified different spending priorities for the Council than the current regime (economic), one that stressed the institutional background (legalistic), and one that conceptualized parks as an environmental asset rather than a facility (ecological).

Two features are apparent from the responses shown in Table 6.7. First is the perception of parks as an environmental asset amongst this subset of the total sample. A majority perceive parks as worth keeping for this reason even if the facilities they offer may be of a lesser quality. The other feature is that no respondent chose the option that too much was being spent on the maintenance of parks. This confirms the pattern of Table 6.1 where a very small proportion of the total sample were prepared to cut spending on parks.

Reasons for respondents wishing to sell were also investigated. These included the idea that there may indeed be too many parks (economic), the possibility that well maintained parks were better than poorly maintained (facilitative), the institutional background (legalistic) and the idea that the land might have better alternative uses (opportunistic). Table 6.8 suggests that those who wished to sell a park in the town generally did so because they valued the existing facilities in the town's parks and

Table 6.7: Reasons for choosing to reduce spending on maintenance

<i>Reason</i>	<i>Number</i>	<i>Percentage of respondents</i>
Altruistic (8.6) ^b	41	29.9
Economic (8.7)	0	0
Legalistic (8.8)	4	2.9
Ecological (8.9)	92	67.2
<i>Total</i>	137 ^a	100.0

Note: ^a The 137 respondents who chose the option to reduce maintenance in Q8a. ^b The figures in brackets are the codings for the option used on the questionnaire.

would rather maintain them in fewer parks than see the quality reduced in a larger number of parks.

Table 6.8: Reasons for choosing to sell one of the parks in Northampton

<i>Reason</i>	<i>Number</i>	<i>Percentage of respondents</i>
Economic (8.11) ^b	3	4.2
Facilitative (8.12)	61	84.7
Legalistic (8.13)	0	0
Opportunistic (8.14)	3	4.2
Other (8.15) ^c	5	6.9
<i>Totals</i>	72 ^a	100.0

Note: ^a The 72 respondents who chose the option to sell a park in Q8a. ^b The figures in brackets are the codings for the option used on the questionnaire. ^c These included the fact that the respondent had a car and was not restricted by the location of parks in the town, a willingness for parks to be privatized and that there was an obvious park to be sold.

This, however, does not fit well with the evidence from Table 6.5 on respondents' identification of the features of parks that contributed most to their personal enjoyment. It might be expected that those choosing to sell a park because they valued the facilities would suggest that they obtained most enjoyment from the parks' facilities. Only 29 (47.5%) of the 61 respondents who chose the facilitative reason had, however, actually done this. A contingency table test of the null hypothesis of statistical independence between those who sell because they value facilities and those who get most enjoyment from park facilities produced a chi-square statistic with a value of 0.9657. With one degree of freedom, this is not statistically significant. The null hypothesis of independence could not, therefore, be rejected. In other words, there was no link between those who valued facilities in the parks and those who chose to sell them because they valued the facilities.

More background on respondents' attitudes towards park provision was sought by asking those who wished to sell a park, which of the parks in the town should be sold. In practice, this question proved a difficult one for respondents, as often they had imperfect knowledge about the parks in the town of Northampton, and the proportion of item non-responses was relatively high at 12.5%. Two parks (the Racecourse and Becketts) attracted a relatively high number of recommendations for sale. This, however, could be because they are well known and, therefore, readily recalled by respondents, an interpretation supported to some extent by the results in Table 6.4, where the Racecourse and Becketts Park are the second and third most popular parks for visits recalled during the previous year. This would make them

unlikely candidates for sale. Equally, of course, it may be that attitudes towards these two parks are polarized between those who value them highly and those who see them as liabilities for the town.

6.7 The Elicitation Procedure

The procedure began with a question (Q9b or Q10e, depending upon the original policy choice made) that introduced respondents to the possibility that they could offset the effect of a proposed Council policy towards parks by paying extra Council Tax. As Bateman et al (1995) indicate, such questions validate zero responses and remove the possibility that respondents feel obliged to give a non-zero response when faced with an actual bid level.

Table 6.9 shows that 142 respondents agreed in principle to pay extra Council Tax. These were presented with bid questions designed to elicit their WTP. 25, however, only did so after initially rejecting the idea. Investigation in Q9e or Q10h of their reasons for an initial refusal to pay caused them to change their mind. This process might be objected to as it did not comply with the suggestion of Arrow et al (1993) to pursue a conservative approach when obtaining the WTP of respondents. Despite this, it was felt to be important to make clear to respondents what they were being asked to do, as some may have thought that they were rating the Council's activities in general. The follow-up questions reinforced the message that respondents were

Table 6.9: Responses to Questions concerning Willingness to Pay Extra Council Tax

	<i>Respondents' Policy Choice</i>		<i>Totals</i>
	<i>Reduced Maintenance</i>	<i>Sell a Park</i>	
<i>Immediate agreement to pay extra Council Tax</i>	91 (Q9b) ^a	26 (Q10e)	117
<i>Agreed after assurance about necessity</i>	7 (Q9f)	1 (Q10j)	8
<i>Agreed after assurance about efficiency</i>	14 (Q9g)	3 (Q10k)	17
<i>Total Agreeing to pay extra Council Tax and then offered bid</i>	112	30	142
<i>Number choosing policy</i>	156	53	209
<i>Percentage prepared to pay Council Tax in policy category</i>	71.79	56.60	67.94

Note: ^a The question number in brackets was answered positively.

only being asked to express a narrowly defined WTP for a particular aspect of the Council’s overall activities.³

The existence of a group of respondents prepared to change their mind does suggest the possibility that respondents can, to a certain extent, be cajoled into stating a positive WTP. It would be valuable to establish how far generating positive responses to CV questions can be taken, as the limit of this procedure would have important consequences for the design of a CV survey. It must be noted, however,

that the majority of respondents (62.7%), when asked to reconsider their initial decision, were unmoved and maintained their original position.

6.8 Issues in Survey Design

Bid amounts of £25, £50 and £100 used in the main survey were randomly assigned to the 142 respondents prepared to consider an increase in Council Tax. As in the pilot, respondents were not presented with a 'don't know' option with the bid. The breakdown of responses obtained to the bid questions is given in Table 6.10.

The bid amounts used were arrived at by what might best be described as a criterion of reasonableness. Thus, a figure of £25 represented a 5.5% increase in Council Tax for Band A tax payers in the year 1996/7, a 4.2% increase for Band C payers and a 1.9% increase for a Band H payers. Similarly, £100 represented a 22.4% increase for a Band A tax payer, a 16.8% increase for Band C payers and a 7.5% increase for Band H payers. The Council Tax figures upon which these percentages are based can be found in Northampton Borough Council (1995) and Northampton Borough Council (1996). Such figures seemed acceptable when Council Tax rose on average by 4.6% for all Council Tax payers in Northampton between the tax years 1995/6 and 1996/7. Respondents, it was felt, would recognize that they were within the bounds of possibility.

Table 6.10: Responses to Bid Values

<i>Bid Level (£)</i>	<i>Respondents' Policy Choice</i>		<i>Total Presented with Bids</i>	<i>Number Accepting Bid</i>	<i>Percentage Accepting Bid</i>
	<i>Reduced Maintenance</i>	<i>Sell a Park</i>			
25	39	9	48	36	75.0
50	41	13	54	31	57.4
100	32	8	40	5	12.5
<i>Totals</i>	112	30	142	72	50.7

Such a heuristic approach to bid design is not unknown in the literature. Bateman et al (1995) is one example of bid design being determined by estimation of what was thought acceptable to potential respondents. Despite this, such approaches ignore more rigorous techniques available for answering two questions about optimal bid design for CV questionnaires, namely:

1. How are the optimal bid levels for the survey determined? and;
2. How is the total sample to be divided up among the different bid levels?

The importance of providing an adequate answer to these questions is that, as a number of authors including Cooper and Loomis (1992), Alberini (1995), Kanninen (1993) and Kanninen (1995) have shown, bid design in CV surveys can bias WTP estimation and have substantial effects on the variance of WTP. Cooper and Loomis (1992), for example, contend that if the appropriate bid vector, the term used for the number of bid levels and the money values of each bid level, is not achieved, and WTP bids are placed in the tails of the WTP distribution, then estimates of mean WTP will be distorted. There is, however, no consensus as yet on the direction of any bias, with Cooper and Loomis (1992), suggesting that including higher bid values in the bid vector will bias estimated WTP upwards, whilst Kanninen (1995) argues that inclusion of higher values will bias it downwards.

Cooper (1993) has shown that it is possible to identify the optimal vector of bid amounts and the optimal allocation of those amounts amongst the sample of respondents in a more precise fashion, provided that some initial idea is available of population parameters, namely measures of central tendency of WTP (usually the mean and median), the variance of the WTP and the statistical distribution of WTP. These knowledge requirements raise the question, which Kanninen (1993) alludes to, that if these parameters were known there would scarcely be a need to carry out a CV survey. As Cooper (1993) suggests, however, the only way to proceed is to pre-test the survey instrument to pick up an indication of the values of population parameters, which can then be used in determining an optimal bid vector that establishes the number of different bid levels to be presented (m), the amounts of the

various bids (b) and the number of respondents to be presented each bid (n). In the main survey, as Table 6.10 shows, the values of each of these were $m = 3$, $b = £25$, $£50$ and $£100$ and $n = 48, 54$ and 40 respectively.

Cooper (1993) calls his process for determining the bid vector, Bid Distribution with Equal Area Bid Selection or DWEABS. In the first step of his iterative two-step model, a certain number of bids are set at equal probability increments along the supposed probability distribution of WTP, such that the total area under the cumulative distribution function (cdf) is divided into areas of equal size. The second step involves finding the most appropriate allocation of the sample size (N) among the different bid levels set in step 1. This calculation has to be repeated N times to allow for all possible values of m. For each such value, bid levels are determined using the DWEABS criterion.

Once an appropriate distribution is determined for the cdf, for example a logistic, it is possible to divide up the area under it into equal parts depending upon the selected number of bids, m. Thus, if m is 2, there would be three different areas under the cdf with b selected such that the area of each equalled 0.3333. In general:

$$P_i = [1/(m + 1)] * i \quad \text{for } i = 1, \dots, m.$$

Once given P_i , which depends upon m, $F(b_i) = P_i$ and $b_i = F^{-1}(P_i)$, where $F(\cdot)$ is the cdf evaluated at the relevant value.

This approach to arriving at the distribution of bid values has a number of advantages, as Cooper (1993) notes. First, it ensures that the bid values will be equally distributed around the median of the expected WTP distribution. Second, it does not create a fixed truncation in the distribution for the upper value of bids. Instead, the upper bid level will increase with the level of m . In addition, the bid levels will become further spread out as they extend into the tails of the distribution with the increased m . Finally, with skewed distributions, DWEABS ensures that the spacing of bids in the distribution reflect the nature of the skewness. With a positively skewed distribution, therefore, bid points will be more widely spaced to the right of the median than compared to the left and vice versa for a negatively skewed distribution.

If step 1 suggested by Cooper (1993) is applied to the data in the main survey, it is possible to identify b and n for the case where $m = 3$, that is the number of bids used in the survey. Assuming a logistic distribution for the bid cdf, and using the results from Model (1) in Table 5.10, which gives the values from a logit regression of the pilot survey data, the appropriate bid vector can be determined.

When $m = 3$, values of P_i will be set at 0.25, 0.5 and 0.75. The three bid levels are then determined from the expression:

$$P_i = 1 / [1 + (\exp-(1.7352 - 0.0246\text{BID}_i))]$$

where the coefficient values are those taken from Table 5.10 and BID_i is the value of the bid to be determined for a particular P_i . In the case of this survey, the values for the bids obtained are (to the nearest pound) £29, £73 and £119.

These values were computed by first estimating mean WTP with the bid value truncated at zero using the method suggested by Buckland et al (1996). This gives a value for the mean WTP of £73.47. The other two bid values then divide the area under the logistic pdf into two equal areas of 0.25, first for the range of potential bid values from zero to 73.47 and then for the range between 73.47 and infinity.

Once the bid levels are derived in step 1, the total sample N can then be allocated to the different bid levels using the expression in Cooper (1993):

$$n_j = \frac{N \Delta b_j [\pi_j(1 - \pi_j)]^{1/2}}{\sum_{i=1}^m \Delta b_i [\pi_i(1 - \pi_i)]^{1/2}}$$

where n_j is the number of the sample allocated to the bid level b_j ;

$$\Delta b_i = (b_{i+1} - b_{i-1})/2 \text{ for } i = 2, \dots, m-1, \Delta b_1 = (b_2 - b_1)/2, \Delta b_m = (b_m - b_{m-1})/2;$$

$$\text{and } \pi_i = 1 - F(b_i);$$

Application to the data in the pilot survey gives values for the number of respondents who would have been presented with each of the bid levels in a sample

size of 142 of 32, 76 and 34 for the bid levels £29, £73 and £119 respectively, values which differ somewhat from those actually used.

A further problem is that there can be no presumption that three is the appropriate number of bid levels to use. Cooper (1993) suggests the number should be that which gives the minimum mean square error (MSE) for WTP^* where:

$$MSE(WTP^*) = E[WTP^* - E(WTP^*)]^2 + [E(WTP^*) - WTP]^2$$

$$\text{s.t. } \sum_{i=1}^m n_i = N$$

WTP^* is the estimated WTP obtained from the pretesting of the survey and WTP is proxied by the value for mean WTP established in the pilot survey. The first term in the expression for $MSE(WTP^*)$ is the variance of WTP^* and the second the square of the bias of WTP^* . Cooper (1993) justifies the choice of the minimum MSE criterion for determining the appropriate levels of m and b , as opposed to alternatives such as a minimum variance unbiased criterion, on the grounds that it strikes an appropriate balance in arriving at an estimator that is both unbiased and of minimum variance. This is a standard justification for using this approach to evaluate an estimator, although Judge et al (1988) note that the MSE of a given estimator may well minimize the MSE for some values of a parameter, but not for others. This problem may, therefore, make the choice of alternative measures for assessing an estimator somewhat more problematic than Cooper (1993) suggests.

The estimate of WTP^* , a discrete linear approximation to $E(WTP) = \int_0^\infty [1 - F(b)]db$, is required to reflect that fact that the information on WTP is in the form of responses to discrete bid amounts b_1, \dots, b_m . The approximation employed by Cooper (1993) is that developed by Duffield and Patterson (1991) and is based on a use of the trapezium rule. The approximation takes the form:

$$WTP^* = \sum_{i=1}^m \Delta b_i p_i$$

where Δb_i is as above; and

$p_i = n_i^y/n_i$ is the percentage of positive responses to b_i .

As n_i^y is a discrete random variable with a binomial distribution and parameters n_i and π_i , its variance is given by $n_i \pi_i (1 - \pi_i)$, yielding a variance for p_i of $\pi_i (1 - \pi_i) / n_i$.

The variance for WTP^* is then:

$$\text{Var}(WTP^*) = \sum_{i=1}^m (\Delta b_i)^2 \pi_i (1 - \pi_i) / n_i.$$

These two formulae provide values that estimate the MSE for each possible level of m from 1 to N . The only adjustment that is required is to substitute $1 - F(b_i)$ for p_i in the formula for WTP^* , as n_i^y/n_i is not knowable. The value of MSE obtained in this

case was 919.51.⁴ If Cooper's experience is anything to go by, it would seem possible to reduce this figure. In other words, the bid vector obtained when $m = 3$ is not that which minimizes MSE. To obtain this, all other possible values of m from 1 to 142 would need to be considered, before the survey design with the appropriate number of bids and values of n for each bid would be derived.⁵

The whole question of bid design is clearly a vexed one in this survey. If another were conducted, therefore, bid design would require more consideration. In the case of $m = 3$, the actual values used for the bid levels were somewhat below what the DWEABS criterion would have suggested. This would imply that more positive responses are likely to have been obtained with the bid vector employed than would have been the case using the bid levels suggested by DWEABS.

6.9 The Remainder of the Elicitation Procedure

The elicitation procedure did not end with the bid questions. Those who had refused a bid were posed a follow-up question (Q9d or Q10g) in which they were asked to indicate how much extra Council Tax they would be prepared to pay if they had rejected the amount in the bid question. This was part of the process, described in Chapter 5, of creating a continuous variable for WTP for use in tobit analysis. All 70 respondents who refused the bid levels with which they were presented expressed, as expected, a positive WTP.

The process of generating a continuous WTP variable continued in Q13 and Q14 when respondents could suggest the maximum amount that they were prepared to pay above the bid level with which they had been presented. All respondents were posed this question irrespective of whether or not they had refused the original bid level. The supposition would be, of course, that those who had refused the initial bid would not express a WTP higher than the bid level. Fortunately, none did, although 4 respondents did raise the amount of their WTP to a level equal to the original bid level. A relatively low proportion responded positively to Q13 (25.4%), which was a concern, as it seemed unlikely that almost three quarters of respondents were presented with an initial bid value that exactly matched their WTP. These results may, therefore, suggest starting point bias.

This bias was tested for by comparing the means for WTP for the respondents presented with a bid level using, as proposed by Thayer (1981), a t-test⁶. The mean WTPs for respondents presented with the three bid levels were respectively £26.55, £44.18 and £44.17. Comparing the mean for those presented with a bid of £25 and those presented with a bid of £50 gave a t-statistic of 4.545. When the comparison was between those presented with a bid of £25 and £100 the t-statistic had a value of 3.0875. Both of these results would suggest starting point bias was present since the means are significantly different at the 1% level. There was, however, no significant difference in the means between those presented with a bid of £50 and £100, leaving this question not entirely resolved.⁷

In Q11 respondents were reminded of their budget constraints. The placing of this question after the value elicitation procedure may have reduced its value. It did, however, as in the pilot yield data on the perception that respondents had of parks as a good. By stating which spending they would cut to increase spending on parks they were making an implicit statement about how they viewed parks as a good.

The use of parks, Table 6.11 shows is, not unexpectedly, seen by nearly half the respondents as entertainment. A large proportion, approximately one-third, also indicated they would cut back on savings to finance any higher Council Tax, perhaps indicating that they viewed changes in expenditure on parks as unexpected shocks to be financed by precautionary savings. This would seem a reasonable response in the circumstances of the survey. Entertainment spending also falls into this discretionary category of spending.

6.10 Socio-Economic Data and Other Variables

The socio-economic indicators of respondents are collected together in Appendix 6.1 to this chapter. In addition to the results shown there, other variables collected included age, gender, length of residence and membership of environmental organizations. Two pieces of information recorded were the date the interview took place and the location of the respondents' homes. These data subsequently proved valuable in the econometric analysis. As public parks are a good where location of

Table 6.11: Sources of savings to make increased Council Tax payments

<i>Source of savings^a</i>	<i>Number of respondents</i>	<i>Percentage</i>
Housing	4	2.8
Food	7	4.9
Energy	7	4.9
Travel	10	7.0
Entertainment	66	46.5
Savings	46	32.4
Other ^b	2	1.4
Total	142	99.9

Notes: ^aThe categories of spending were given to respondents in Q11. ^b Respondents who declined to identify a particular spending category

the individual in relation to the good is important because of the time costs attached to consumption, each respondent's postcode was used as a proxy for the effect of this variable on WTP.

The mean age of the 207 respondents who provided this information was 45.7 years, the youngest respondent being 19 and the oldest 92. 47.9% of respondents (or exactly 100) were male. This figure contrasts significantly with the pilot survey where almost two-thirds of respondents were men. Concerns that arose in the pilot, therefore, that women would not be properly represented proved unfounded. As the percentage of males over 18 in Northampton given in the 1991 Census is 47.8%, the sample would appear in this respect to be representative.⁸

For the 208 respondents who gave a valid answer, the mean length of residence in Northampton was 25.2 years (one refused on the grounds that her age could be determined from this information), a figure reflecting a tendency for a number of respondents to have lived in Northampton all their lives. Only 16 respondents (7.7%) were members of environmental organizations. The data on membership of environmental organizations did serve, however, as a dummy variable in econometric analysis, as suggested by Hanley and Craig (1991), although, as Spash (1997a) points out, there are doubts about the extent to which such a variable reflects environmental attitudes.

The sample was representative of the town's population in terms of household size, but not age, occupational status or educational qualification, as the chi-square goodness of fit statistics in the tables in Appendix 6.1 show. The sampling process tended to mitigate against including those aged 18 to 24. As in the pilot, this probably reflected the initial approach to the occupier of a property.⁹ Professional occupations¹⁰ seemed overrepresented and those in craft employment underrepresented. Those with no or lower level qualifications were probably underrepresented, whilst those with higher level qualifications are overrepresented. This latter effect could be due to problems some potential respondents may have had in being interviewed by, as they would see it, well qualified interviewers.

6.11 Conclusions

In this chapter a number of features of the demand for parks in Northampton have been derived from the data collected in the CV survey. These, in themselves, give some indication about the direction that policy concerning the provision of this type of good can take. The exact nature of the policy suggestions are considered in detail in Chapter 9, once further analysis of the main survey data is completed. For now, however, it is sufficient to recognize that CV surveys provide somewhat more than simple estimates of the value of non-market goods. They are also sources of information on the good under consideration that help to inform policy-making.

As in the pilot, analysis of the data extended to tobit and logit analysis. The tobit analysis of the results from the main survey is presented in Chapter 7 and in Chapter 8 the same is done for the logit analysis.

Notes

1. The student, Gareth James, subsequently used the data he collected in a final year undergraduate dissertation. It had been hoped to obtain more assistance to enlarge the sample size, but this proved impossible.
2. An apparent anomaly is that two respondents gave, as part of their reason for the provision of parks, their own use of the parks, having declared in Q4 that

they had not used the parks in Northampton. Q4, however, refers to use over the previous twelve months, so these individuals may have had it in mind to use the parks again in the future.

3. Table 6.1A summarizes why respondents were initially unwilling to pay any extra Council Tax.

Table 6.1A: Reasons for not wishing to pay extra Council Tax

<i>Reasons^b</i>	<i>Respondents' Policy Choice</i>		<i>Total</i>
	<i>Reduced Maintenance</i>	<i>Sell a Park</i>	
Not prepared to pay any extra Council Tax	7	4	11 (12.0) ^a
Already paying enough Council Tax	22	11	33 (35.9)
Not convinced extra money would be used efficiently	30	7	37 (40.2)
Do not agree with the type of question	5	1	6 (6.5)
Other reason ^c	1	4	5 (5.4)
<i>Totals</i>	65	27	92 (100)

Notes: ^aPercentages are in brackets. ^b These were listed on flash cards when answering Q9e or Q10h. ^c These included insufficient income and a view that the Council should have other priorities than spending extra on parks.

4. Using the values of b and n already reported, the estimate of WTP^{*} is £43.35, the estimated variance of WTP^{*} is 12.38 and the square of the bias is 907.13.

This gives the MSE of the estimated WTP when m = 3 of 919.51.
5. There are other considerations with bid design. Kanninen (1993) suggests introducing an iterative element into the procedure for estimating the bid vector. As each set of questionnaires is administered, new estimated values

of the parameters can be calculated and used to update the bid values and the number of the bids. CV survey design is then a sequential process that tends asymptotically towards an optimal bid design.

The choice of the distribution of WTP from a number of possibilities including the normal, the logistic, the Weibull and the log normal can also affect estimated means. Alberini (1995) shows that incorrect assumptions about the distribution of WTP can lead to bid designs with more bid values in the upper tail of the WTP distribution than in the lower with consequent effects for the estimated WTP parameters.

6. The two-tailed test statistic is given by:

$$t = (X_1 - X_2) / (S \sqrt{1/n_1 + 1/n_2})$$

where X_1 and X_2 are two different means;

n_1 and n_2 are the size of the samples used to estimate the means;

$S^2 = [(n_1 - 1) \text{Var}_1 + (n_2 - 1) \text{Var}_2] / [n_1 + n_2 - 2]$; and

Var_1 and Var_2 are the variances of the two means.

7. A correlation coefficient between expressed WTP and the bid levels presented to all 142 respondents, suggested by Ready et al (1996) as a test of starting point bias, had a value of 0.2375. This is not high, although significantly different from zero at the 1% level. A t-statistic calculated from the expression $t = \sqrt{(n-2)(r^2/1-r^2)}$, where r is the value of the correlation coefficient and n the size of the sample, had a value of 2.9135. Although the

result suggests starting point bias, the relatively low value of the coefficient again casts doubt on whether this bias exists.

8. The z-score of the sample proportion is 0.03, well below any relevant critical value.
9. A dummy variable with a value of one for those aged 24 and under and zero for those aged over 24 had a negative sign on the coefficient but was statistically insignificant when used as an explanatory variable in both logit and tobit specifications.
10. Some confusion was caused by the category 'professional qualification'. It was intended to mean post-degree qualifications of a type obtained by accountants etc. A number of respondents, however, reported qualifications such as hairdressing diplomas, so interpreting the category as occupational qualification. This problem was addressed by asking respondents who declared a professional qualification what it was. Where a misunderstanding occurred, the response was placed in the appropriate category by the interviewer. For the example mentioned, therefore, this was recorded as an apprenticeship.

APPENDIX 6.1

Socio-economic Characteristics of the Main Survey Sample

Table A6.1: Respondents by Age Categories

<i>Age Category^a</i>	<i>Number of respondents</i>	<i>Percentage in Northampton^b</i>
18-24	13	14.3
25-39	72	31.4
40-59	69	29.5
60 and over	53	24.8
<i>Totals</i>	207	100.0
<i>Chi-square goodness of fit statistic ^c</i>		11.1496 ^d

Notes: ^a The categories are those used in the pilot survey. ^b Calculated from data in Table 2 of Part 1 of the 1991 Census for Northamptonshire. ^c The statistic tests the null hypothesis that the percentage of the sample in each age category is the same as that for Northampton. The chi-square statistic equals $\sum_i (O_i - E_i)^2/E_i$, where O_i is the observed frequency in the age category and E_i is the expected frequency in the category. $E_i = nP_i$, where n is the total in the sample and P_i is the population percentage in the category. The degrees of freedom for the statistic equal the number of categories minus one. ^d Significant at the 5% level.

Table A6.2: Occupational Status of Respondents

<i>Category</i>	<i>Number of respondents</i>	<i>Percentage in Northampton^b</i>
<i>In Employment^a</i>		
Manual	23	12.5
Craft	10	9.7
Clerical/Secretarial	18	11.7
Technical	11	4.8
Administrative/Managerial	24	8.4
Professional	22	4.5
Sales	9	4.5
Personal Services	10	4.7
<i>Not in Employment</i>		
At home	17	10.2
Student	6	3.2
Retired	46	20.7
Unemployed	13	5.2 ^c
<i>Totals</i>	209	100.1
<i>Chi-square goodness of fit statistic</i> 28.1655 ^d		

Note: ^a Respondents were asked to place their occupation into one of the categories shown. All cases were placed in an appropriate category even though an option for 'Other' was provided. ^b Percentages estimated from figures on Economic Position given in Table 8 of Part 1 of the 1991 Census of Northamptonshire and those on Occupation in Table 99 of the 10% sample in Part 2 of the 1991 Census. ^c The unemployment figure here is lower than that actually pertaining at the time of the survey, but is used for the sake of consistency. The figure for January 1996 in Northampton, given in the 1996 edition of *Regional Trends*, was 6.4%. ^d Significant at the 1% level.

Table A6.3: Household Income of Respondents

<i>Income^a</i>	<i>Number of Respondents</i>	<i>Percentage of Respondents</i>
Less than £5 000	28	13.4
£5 000 to £10 000	39	18.7
£10 000 to £15 000	31	14.8
£15 000 to £20 000	31	14.8
£20 000 to £25 000	27	12.9
£25 000 to £30 000	10	4.8
£30 000 to £35 000	11	5.3
More than £35 000	22	10.5
No response ^b	10	4.8
<i>Totals</i>	209	100.0

Note: ^a The exact income for each respondent would have been preferable to categories, but obtaining this was not thought possible, first, because respondents might have considered it too intrusive, and, as Cramer (1971) points out, simply have declined to answer. Secondly, respondents, even if prepared to divulge the information, might not have had a clear idea of what their income actually was. ^b No attempt was made to estimate incomes for respondents refusing to provide these details.

Table A6.4: Household Size

<i>Number in Household</i>	<i>Number of Respondents</i>	<i>Percentage in Northampton^a</i>
1	31	25.5
2	39	34.3
3	17	16.3
4	28	16.1
5	7	5.5
6	2	1.5
7 or more	0	0.7
<i>Totals</i>	124 ^c	99.9 ^b

Chi-square goodness of fit statistic^d 4.0820

Notes: ^a Calculated from data in Table 22 of Part 1 of the 1991 Census for Northamptonshire. The 382 households deemed by the census to have zero residents were ignored when calculating these percentages. ^b Does not add to 100 due to rounding error. ^c The reduced size of the sample reflected omission of a question from the original survey. It was only introduced once the main survey had been under way for some time. ^d Calculated by combining the values for 5, 6 and 7 or more in a household. As a rule of thumb, the expected frequency in each category should not be less than five when calculating this statistic. Only when the three categories were combined was this condition met.

Table A6.5: Education Levels of Respondents

<i>Education Level</i>	<i>Number of Respondents</i>	<i>Percentage in Northampton^a</i>
No formal qualification	51	NA
Apprenticeship	36	NA
`O'level/GCSE/BTEC National	52	NA
`A'level/BTEC Higher	15	NA
<i>Subtotals</i>		88.7 ^b
HND or equivalent	10	NA
Professional qualification	33	NA
<i>Subtotals</i>		5.9 ^c
Degree	6	4.9 ^d
Higher degree	6	0.5 ^e
<i>Totals</i>	209	100.0

Chi-square goodness of fit statistic^f 81.6362^g

Notes: ^a Estimated from data in Table 84 of the 10% sample in Part 2 of the 1991 Census for Northamptonshire. It was not possible to obtain data on the same categories used in the CV survey. The results reported, therefore, reflect the data available. NA=categories for which percentages were not available. ^bPercentage of Northampton residents who do not have level a, b or c qualification, as defined in the Census. ^c Percentage of Northampton residents with level a qualification, as defined in the Census. ^d Percentage of Northampton residents with level b qualification, as defined in the Census. ^e Percentage of Northampton residents with level c qualification, as defined in the Census. ^f Calculated by combining the categories for degree and higher degree in order to meet the requirement for the expected frequency of each category to be greater than five. ^g Significant at the 0.1% level.

CHAPTER SEVEN

ESTIMATING MEAN WILLINGNESS TO PAY: THE USE OF TOBIT

ANALYSIS

7.1 Introduction

In Chapter 5, it was shown that tobit analysis required the WTP variable to be continuous in nature if it were to be used with data from a CV survey. A similar procedure, therefore, to that employed with the pilot, set out in Section 5.4, was used in the main survey to construct a dependent variable censored at zero that could be used in tobit analysis. This adjustment reduced the number of usable observations in the main survey from 209 to 152.¹ The breakdown of the responses used to create the continuous variable for WTP in the main survey is given in Table 7.1.

Table 7.1: Observations used as the Dependent Variable in the Tobit Analysis

<i>Responses</i>	<i>Number of Respondents</i>
Yes to Q9d	51
Yes to Q10g	10
Yes to Q13	24
Zero WTP	67
<i>Total</i>	152

Using this dependent variable, it was possible to develop an econometric model based on tobit analysis which assumed homoscedasticity. It yielded significant explanatory variables of WTP and estimates of mean WTP, which are reported in the next section. A similar process is carried out in Section 7.3 for a heteroscedastic tobit model. The chapter concludes with a discussion of policy recommendations suggested by the results obtained.

7.2 Determinants of Willingness to Pay

The tobit analysis assuming homoscedasticity generated the models in Table 7.2. These were achieved by considering the explanatory variables listed in Appendix 7.1 to this chapter. As already discussed, more variables were used in the main survey than in the pilot.

In considering the models in Table 7.2, it is possible to identify four statistically significant explanatory variables for WTP in the tobit framework. These are age (AGE), the interviewer by whom the respondent was interviewed (INTERVIEWER), the fact of being interviewed in the month of June (DATED6) and being unemployed (UNEMP). In Model (5), which is the best-fitting on the AIC of those presented, these variables taken together are jointly as well as individually significant. Taking account of the signs of the coefficients on these four variables would suggest that respondents were less likely to be willing to pay extra for parks in the town if they were:

Table 7.2: Explaining WTP in a Tobit Framework with Homoscedasticity

Dependent Variable: WTP for maintaining public park provision in Northampton in the form of higher Council Tax

<i>Independent variables</i>	<i>Model (1)</i>	<i>Model (2)</i>	<i>Model (3)</i>	<i>Model (4)</i>	<i>Model (5)</i>
Constant	12.886 (16.583) ^d	-9.8770 (11.890)	10.645 (15.396)	17.918 (15.144)	17.835 (14.166)
AGE	-0.69541 ^b (0.2968)		-0.6467 ^a (0.2495)	-0.71949 ^a (0.2445)	-0.7106 ^a (0.2400)
INTERVIEWER	21.534 ^c (11.662)		26.878 ^b (10.997)	22.649 ^b (10.831)	32.823 ^a (10.803)
DATED6	-29.064 ^b (11.923)		-23.838 ^b (10.779)	-20.606 ^b 10.476	-24.668 ^b (10.431)
UNEMP	-44.640 ^b (21.544)		-54.530 ^a (20.020)	-52.077 ^a (19.264)	-54.559 ^a (19.661)
HWAYS1	16.317 ^c (8.4320)		15.477 ^c (7.9778)	13.249 ^c (7.7813)	
VIEW	19.693 ^b (8.3462)	13.101 ^c (7.8876)			
DATED5		15.769 ^c (8.9749)			
HOUSINGD2		-24.005 ^a (7.9477)			
OPEN SPACE		25.347 ^a (8.8183)			
EVENT		24.063 ^b (11.985)			
SALES		44.540 ^b (18.188)			
Q7D4 ^e				35.078 ^b (14.713)	
Q7D13 ^f				-52.695 ^c (27.923)	
SIGMA	40.076 ^a (3.4863)	33.808 ^a (3.1766)	41.032 ^a (3.4433)	39.370 ^a (3.2834)	41.415 ^a (3.4238)
Number of observations	118	96	143	142	150
Log-likelihood function	-414.081	-334.301	-460.545	-454.815	-479.917
Likelihood ratio statistic	22.417 ^a	27.865 ^a	27.857 ^a	37.694 ^a	27.208 ^a
Lagrange multiplier statistic	25.733 ^a	18.141 ^a	46.865 ^a	45.610 ^a	51.241 ^a
AIC	7.1200	7.0896	6.5111	6.5044	6.4522

Notes: ^a Significant at the 1% level. ^b Significant at the 5% level. ^c Significant at the 10% level.

^d Standard errors are given in brackets. ^e A dummy variable derived from responses given to Q7. It takes a value of one for those respondents who felt that parks should be provided by the Council both because of their own use (option 1 in Q7) and because they felt that parks should be there for future generations (option 4 in Q7). Otherwise, it takes a value of zero. ^f A further dummy variable derived from responses to Q7. It takes a value of one for those respondents who felt that parks should be provided by the Council because the environment in Northampton is then cleaner (option 3 in Q7) and a value of zero otherwise.

- a) older;
- b) interviewed by GJ;
- c) interviewed in June; and
- d) unemployed.

Two of these results seem to require some explanation. First, it is surprising that age should mitigate against WTP, as it might have been felt that older people would make greater use of parks and, therefore, be more prepared to pay extra for them.

This view is not borne out by these results. A similar point could be made about the unemployed who, with more leisure time on their hands, might be presumed ready to make greater payments. Alternatively, of course, it could be argued that the unemployed are actually looking for work and, therefore, unable to spend time using the parks. This would make them less willing to pay. Both the age and unemployment variables had negative signs, it should be noted, even when income was included as a control in the specification of Model (5) in Table 7.2.

For the other two variables, the first suggests some degree of interviewer bias, whilst the second seems to imply that WTP is dependent upon time of year. It may be that in June a greater range of alternative outdoor activities are available, so reducing WTP for parks at that time of year.

Further variables are statistically significant in other models presented in Table 7.2, and the majority of results obtained are plausible. For example, those who use parks for enjoying the view are, in Models (1) and (2), more likely to pay extra. This

would seem reasonable, since a view would presumably be more pleasant in a well maintained park. Those who enjoy the open space that parks provide are also in Model (2) seen to be prepared to pay more as are those who use the parks for special events. It should be noted that Model (2) has, of all the models in Table 7.2, the lowest value of sigma, which in tobit analysis serves as a measure of goodness of fit. It also has the highest value for the log-likelihood function.

The extent to which Model (2) is a good fitting model also adds some force to the result, derived from that model, that those who think too little is being spent on housing would be less prepared to spend money on parks. They presumably would want to spend the money on extra housing. Complementing this result, in Models (3) and (4), those who think the amount spent on highways is about right are prepared to pay more for parks. Again, this would seem logical. Taken together, these results appear to validate the data in that they match what might be expected to happen if respondents were taking account of their wider preferences when formulating their WTP for parks.

What did not correspond to expectations was that no connection emerged between those who thought too little was being spent on parks and WTP. It might have been anticipated that there would have been a positive relationship between these two variables, but, despite investigation in a number of different specifications, no evidence of such a connection emerged. When dummies for perceptions of spending on refuse collection and recreational services were included these too were not statistically significant.

Model (4) includes two variables linking WTP with respondents' reasons for wishing to see parks in the town. Those, therefore, who wish the parks to be there as an environmental asset were less willing to pay extra, which seems sensible. Having parks for this reason does not require a great deal of spending by the Council.

Alternatively, those who see the reasons for parks in terms of their own and future generations' use would also presumably be prepared to pay for this usage, a view confirmed by the result in Model (4).

Table 7.3 gives estimates of mean WTP determined from the values in Model (5).

The approach adopted in arriving at these figures is that used in Section 5.4 with the pilot survey data.

Two approaches were adopted to the problem of estimating total WTP for Northampton's population. First, it can be assumed that the responses represent expressions of individual WTP. The justification for this view comes from the fact that in some cases two individuals from the same household were interviewed.

Whilst each was always aware of the other person's expression of WTP, this did not deter them from giving their own figure. On no occasion, therefore, did a respondent alter their responses because of what had been said by the other member of the household. If this interpretation is placed on the responses obtained, then it becomes necessary to take the number in the population aged 18 and over from the figures reported in the 1991 Census, as is done for the measure of population WTP I in Table 7.3.

Table 7.3: Estimates of mean WTP from Tobit assuming homoscedasticity^a

<i>Measure of mean WTP</i>	<i>Mean (£) WTP</i>	<i>Estimated Population WTP (£) I ^b</i>	<i>Estimated Population WTP (£) II ^c</i>
For those indicating a positive value	28.67	2 187 756 ^c	1 147 435
For all observations	10.75	1 066 846 ^d	559 539
For potential observations	-13.20	-1 801 232 ^e	-944 711

Note: ^a The values used in estimating the measures of mean WTP, taken from Model (5) in Table 7.2, were $X\beta = -13.1964$, $z = -0.31864$, $F(z) = 0.3750$, $f(z) = 0.3791$ and $\sigma = 41.415$. ^b Estimated using the figure of 136 457 for those aged 18 and over in Northampton given in the 1991 Census. ^c Estimated by taking a proportion of Northampton's population equal to that in the sample who had indicated a positive WTP on the continuous scale used in the tobit analysis. The relevant proportion was, therefore, $85/152 = 0.5592$. ^d The proportion of Northampton's population employed in this case was the proportion of the sample included in the tobit analysis, namely $0.7273 = 152/209$. ^e Calculated using the figure of 136 457. ^f Based on the figure for the number of households in Northampton in the 1991 Census, which was 71 569. The same proportions are applied to the measures of mean WTP as for population.

The alternative measure, given as population WTP II in Table 7.3, is based upon the number of households in Northampton (71 569). This approach is justified if respondents in the survey are assumed to be representing their households in the responses that they are giving and is often used for estimating population WTPs in CV surveys. Experience in the conduct of this particular CV survey, however, would suggest that this method of considering total WTP would be less appropriate for the respondents interviewed in the CV survey.²

The wide range of estimates for mean WTP in Table 7.3 gives some cause for concern, as, clearly, differing policy conclusions follow from the different values obtained. An important difference is that the figures would seem to suggest that,

taking Northampton's population as a whole, there is potentially a negative value for the parks in the town, a result corresponding to experience in the pilot survey. As in the pilot, however, the implausibility of a negative WTP for any form of public good needs to be borne in mind. The issues raised by these differing estimates are considered in more detail in Section 7.4.

Before getting too anxious about these results, it is also apparent from the Lagrange multiplier statistics in Table 7.2, that there is evidence of heteroscedasticity. This would lead to the conclusion that a tobit model assuming heteroscedasticity might provide an improved specification for the determinants of WTP. The results obtained when this was done are discussed next.

7.3 The Tobit Model with Heteroscedasticity

As in Chapter 5, the approach adopted assumed a variance of the form:

$$\sigma^2 = \exp(a/x) \quad (7.1)$$

with a being a vector of coefficients and x a vector of explanatory variables.

It was possible using age and the variable for interviews in June as elements of x in equation (7.1) to generate the model in Table 7.4. This model uses the same explanatory variables as Model (5) in Table 7.2.

Table 7.4: A Heteroscedastic Tobit Model of Determinants of WTP

Dependent Variable: WTP for maintaining public park provision in Northampton in the form of higher Council Tax

<i>Independent variables</i>	<i>Coefficients (Heteroscedastic)</i>	<i>Partial Derivatives</i>	
Constant	8.6351 (13.696) ^d	5.1336 (8.3278)	
AGE	-0.46081 ^b (0.18884)	-0.43466 ^b (0.18645)	
INTERVIEWER	30.272 ^a (10.891)	17.997 ^a (3.7734)	
DATED6	-12.939 ^b (6.3745)	-19.687 ^a (4.3587)	
UNEMP	-63.880 ^c (34.225)	-37.977 ^c (20.876)	
SIGMA	76.060 ^a (23.913)		
<hr/>			
AGE ^s	-0.01296 ^c (0.00757)		
DATED6 ^s	-0.96751 ^a (0.28843)		
Number of observations	150		
Log-likelihood function	-471.8685		
Likelihood ratio statistic	43.303 ^a		
Lagrange multiplier statistic	44.3884 ^a		
AIC	6.372		
<i>Estimates of Mean WTP</i>	<i>Value (£)</i>	<i>Estimated Population WTP I (£)^e</i>	<i>Estimated Population WTP II (£)^e</i>
For those indicating a positive value	55.53 (28.67) ^f	4 237 936 (2 187 756)	2 222 429 (1 147 435)
For all observations	29.32 (10.75)	2 909 759 (1 066 846)	1 526 111 (559 539)
For potential observations	5.54 (-13.20)	755 972 (-1 801 232)	396 492 (-944 711)

Notes: ^a Significant at the 1% level. ^b Significant at the 5% level. ^c Significant at 10% level. ^d Standard errors are given in brackets. ^e Values were calculated using the approach adopted in Table 7.3. ^f Figures in brackets are the equivalent estimates of mean WTP and population WTP taken from the homoscedastic tobit model (5) in Table 7.2. ^g Estimates of the coefficients in vector α from equation (7.1).

The heteroscedastic model in Table 7.4 has the same signs on the coefficients as in Model (5) of Table 7.2, which supports the discussion on the meaning of these results in the previous section. The variables also remain statistically significant explanatory variables of WTP both individually and jointly.

Although there are these similarities, a likelihood ratio test confirms that allowing for heteroscedasticity improves the model. The value of the test statistic when Model (5) in Table 7.2 is used as the restricted version of the model is 16.097, considerably above the critical value at the one per cent level of significance with two degrees of freedom (9.210). This result also confirms the heteroscedasticity in the original model, since it can be tested for using a likelihood ratio test. The improved specification of the model in Table 7.4 is verified by the reduced value of the AIC in this model.

In the heteroscedastic case all estimates of mean WTP, reported in Table 7.4, are positive, so removing the problems of a negative value found with the homoscedastic model. This result would seem to be due to the misspecification of the original model.

Also reported in Table 7.4 are the partial derivatives for the coefficients in the heteroscedastic case. It is not possible in the tobit model to interpret coefficients directly as the derivatives of the variables. The coefficients are, in fact, as Judge et al (1988) show, the partial derivatives of the latent dependent variable. To obtain the

effect on the censored dependent variable, in this case WTP, it is necessary to use the expression:

$$\frac{\partial E(y)}{\partial x_i} = \Phi(z) \beta_i$$

where x_i is a dependent variable taken from the vector X and β_i is the coefficient on x_i .³ The values of these derivatives are normally estimated at the mean of the dependent variable and this is the case here.

Taking the value of the partial derivative on the coefficient for age implies that an increase in age of one year for a resident of Northampton aged 45 (the approximate mean age of the sample for the specification) will reduce WTP to maintain parks in the town by approximately 43 pence. If the value of this derivative were constant across all ages it would mean that an eighteen year old in Northampton would, other things being equal, be prepared to pay £24.78 more than a seventy five year old to maintain the parks in their current state.⁴

The other three variables in the specification in Table 7.4 are dummy variables taking values of one or zero. An indication of the possible consequences these have for WTP for the different categories of 45 year old respondents is given in Table 7.5. The table shows that for the respondent of sample mean age, all but one class prefers to receive rather than make payments if the current state of the parks in the town were to be maintained. This might seem unexpected given the positive mean WTPs reported earlier. However, the fact that the calculations have been carried out at the

Table 7.5: WTP for 45 year old respondents derived from a Heteroscedastic Tobit Model

<i>Interviewer TC</i>		
	<i>Unemployed</i>	<i>In Employment</i>
<i>Interviewed in June</i>	-54.11 ^a	-16.13
<i>Interviewed in other months</i>	-34.42	3.56
<i>Interviewer GJ</i>		
	<i>Unemployed</i>	<i>In Employment</i>
<i>Interviewed in June</i>	-72.10	-34.13
<i>Interviewed in other months</i>	-52.42	-14.44

Note: ^a WTP in pounds.

sample mean age denotes that conclusions cannot be drawn about the entire population from the figures in the table. The figures in Table 7.5 are also based on the censored distribution of WTP and would, therefore, only be comparable with the mean ‘for all observations’.

Table 7.5 confirms that interviewer bias continues to have a relatively large impact on estimated WTP in the heteroscedastic model. This, perhaps more than anything, undermines the use of the tobit approach in this survey. Nevertheless, it is worth noting that, irrespective of interviewer, there is a strong effect on WTP from both the time of the year at which the interviews were conducted and the fact that the

respondent was unemployed. These are results with policy implications for the Council, a discussion of which follows in the next section.

7.4 Policy Considerations

The policies suggested are primarily based on the results of the heteroscedastic model in Table 7.4, which, as suggested, represented the best specification attainable from the tobit analysis. Some of the other models are used, however, to make further suggestions. The full list of possible policies proposed is summarized in Table 7.6.

Before examining the explanatory variables derived from the tobit analysis for policy implications, perhaps the most important result to consider is the one showing that the survey indicates a positive WTP for maintaining parks amongst the residents of Northampton. Of the three measures of mean WTP based upon the tobit analysis, the most relevant for the purposes here would be that using the expectation of the censored dependent variable. As there is little prospect of the level of park provision being substantially altered, it is best to consider the situation of those who are prepared to pay, whilst acknowledging the existence of a number of limit observations in the form of those who are not willing to pay anything. Given the figure of £2 909 759 for the conditional expectation, the conclusion would be that there is substantial support for current levels of spending on parks.

Table 7.6: Policy Proposals on Park Provision arising from the Tobit Analysis

- Examine further the extent to which older residents could be attracted to the parks
- Provide more facilities and events for younger residents
- Examine budgets for spending on parks through the year
- Provide more activities of relevance to the unemployed
- Timetable events to reflect needs of the employed
- Maintain parks to a satisfactory standard as open spaces
- Continuation with the current level of park provision in the town*

Note: * This is the only policy proposal also found in Table 5.12, which summarized policy suggestions arising from the pilot survey.

Turning to the explanatory variables unearthed by the tobit analysis raises a number of issues. The first of these is that if age determines WTP there are two conceivable policy alternatives for the Council. First, they could attempt to identify why, as residents grow older, they seem to value parks less. If reasons can be found, it could subsequently be possible to alter park provision to reflect the desires of older residents. The alternative would be to try and reflect the result on age by providing more facilities in the parks suitable for younger residents of the town.

The variable DATED6 picks up the effect of the time of year on WTP. The implication of the result is that Council spending would need to be targeted at months other than June. This could be done, for example, by spending more on spring than summer flowers. It might also be preferable to keep special events in the

parks during this month to a minimum. There is, however, a potential problem here in that the dummy variable on timing may not be exogenous. Instead, it may be endogenous since the decision to pay or not to pay for parks may be related to their state or the facilities provided in them during June.⁵ Advice on reorganizing Council spending needs to be circumspect, therefore, as it may actually be that the results showing a negative effect on WTP of the month of June simply reflect the poor condition of the parks at that time of year. More work would be needed before a final judgement on this result could be made.⁶

The other key result to have policy implications is that being unemployed has a negative effect on WTP. This would suggest that the Council might wish to contemplate providing a suitable environment in the parks for activities attractive to this group. The alternative would be that, if the employed are prepared to pay more, the Council may wish to ensure that more is done to assist this group by ensuring a range of activities take place at times convenient for those in work, even if, with increasingly flexible work patterns, this may not always be straightforward to achieve.

From the other specifications reported in Table 7.2, there are, despite the associated misspecification problems, three points to consider. First, if enjoying the view is a significant variable, it would appear beneficial for the Council to guarantee the standard of the parks. The fact that those who appreciate the open space provided by parks would also be prepared to pay more indicates that the Council should resist developments that impinge upon parks as open space. Finally, the provision of

special events in the parks would seem to provide some value to residents of Northampton, so supporting Council policy in this area. The evidence on this final point was not strong, however, and, as with the thoughts on the role of enjoying the view and the importance of parks as open space, this recommendation cannot be a strong one.

7.5 Concluding Remarks

The above proposals give some indications of what might be done on the basis of the results obtained from the tobit analysis and, despite the caveats, are not to be entirely discounted. The policy issues raised by the discussion are, consequently, returned to in Chapter 9.

Problems remain, however, with the nature of the dependent variable in the tobit approach. As reported in Chapter 6, only 25.4% of respondents accepting an initial bid took up the opportunity to alter their WTP from the bid level with which they were presented. There was also evidence of starting point bias and that the dependent variable was not continuous as is assumed in the tobit approach. This would suggest that whilst the tobit analysis generated conclusions relevant for policy purposes, it may not be the most appropriate approach for analyzing econometrically the data in this survey.

Faced with this problem, it is necessary to turn to an econometric approach, logit analysis, that reflects more accurately the nature of the survey data. In the next chapter, the results from the application of logit analysis to the data in the main survey are reported and the policy prescriptions arising from these results are discussed.

Notes

1. Attempts were made to establish a tobit model based on all 209 observations. Although some individual explanatory variables were identified, it did not prove possible to generate a satisfactory model using these results.
2. Quiggin (1998) has shown that this question of whether to use individuals or households is not just a technical matter, as previously supposed, but can depend upon the nature of altruism found amongst individuals. Differences can arise in WTP between individuals and households, he suggests, where altruism is non-paternalistic, that is individuals are attempting to maximize household utility. The significance of this result was not pursued in this thesis.
3. Equation (7.2) is actually the partial derivative of equation (5.2) with respect to x_i . These values, calculated by Limdep, are the ones reported.
4. A correlation coefficient between age and the WTP figure used in the tobit analysis had a value of -0.16608. This was significantly different from zero at the 1% level.

5. The same problem, as Maddala (1983) shows, is often a feature of studies attempting to link union membership to wage rates using a dummy variable to represent union membership.
6. To assess the possible impact of endogeneity would entail analysis of data on monthly spending on parks, which were unavailable.

APPENDIX 7.1

Explanatory Variables Used in the Econometric Analysis

As in the pilot, the variables used in the main survey were based on socio-economic data and responses to questions about park use collected from respondents. In contrast to the pilot, it was possible in the main survey to employ some continuous explanatory variables. In particular, income, age and length of residence in the town were no longer defined as dummy variables. The table below gives the complete list of variables used in the tobit analysis in Chapter 7 and the logit analysis in Chapter 8.

Table A7.1: Independent Variables Employed in Tobit and Logit Analysis of the Main Survey

<i>Variable^a</i>	<i>Description</i>
PAYMENT IN PRINCIPLE (Q9b or Q10e)	1 = a positive response to the question asking the respondent if they would be prepared to pay extra Council Tax; 0 = a negative response. ^b
RESPONSE TO BID (Q9c or Q10f)	1 = a positive response to the bid level; 0 = a negative response.
BID (Q9c or Q10f)	The value of the bid level put to the respondent.
AGE (Q15b)	Age, in years, reported by the respondent
OLD (Q15b)	1 = respondent aged 60 or over; 0 = otherwise.
YOUNG (Q15b)	1 = respondent aged 24 or under; 0 = otherwise.
GENDER (Q15b)	1= male; 0 = female.
RESIDENCE (Q16b)	Number of years of residence in Northampton reported by the respondent.

MANUAL (Q18b)	1 = a manual occupation; 0 = otherwise
CRAFT (Q18b)	1 = a craft occupation; 0 = otherwise
CLERICAL (Q18b)	1 = a clerical occupation; 0 = otherwise
TECHNICAL (Q18b)	1 = a technical occupation; 0 = otherwise
ADMIN/MANAGER (Q18b)	1 = an administrative/managerial occupation; 0 = otherwise
PROFESSIONAL (Q18b)	1 = a professional occupation; 0 = otherwise
SALES (Q18b)	1 = a sales occupation; 0 = otherwise
PERSONAL (Q18b)	1 = a personal services occupation; 0 = otherwise
UNEMP (Q18c)	1 = unemployed; 0 = otherwise
AT HOME (Q18c)	1 = at home and not in employment; 0 = otherwise
STUDENT (Q18c)	1 = student; 0 = otherwise.
RETIRED (Q18c)	1 = retired; 0 = otherwise
PROFQUALS (Q20)	1 = professional qualifications; 0 = otherwise
HIGHER DEGREE (Q20)	1 = a higher degree; 0 = otherwise
DEGREE (Q20)	1 = a degree; 0 = otherwise
HND (Q20)	1 = an HND or equivalent qualification; 0 = otherwise
APPRENTICE (Q20)	1 = an apprenticeship; 0 = otherwise
A LEVEL (Q20)	1 = A levels or equivalent qualifications; 0 = otherwise
GCSE/O LEVEL (Q20)	1 = GCSE/O levels or equivalent qualifications; 0 = otherwise
NOQUAL (Q20)	1 = no formal educational qualifications; 0 = otherwise
INCOME (Q19)	Household income as the mid-point of an income range reported by the respondent
INCOMESQ	The square of the respondent's gross household income

NOHHOLD (Q19)^c	Number of residents in the respondent's household reported by the respondent
ENVIRONMENT-ALIST (Q21a)	1 = members of an environmental organization; 0 = otherwise
LD1	1 = living in an address with post code NN1; 0 = otherwise
LD2	1 = living in an address with post code NN2; 0 = otherwise
LD3	1 = living in an address with post code NN3; 0 = otherwise
LD4	1 = living in an address with post code NN4; 0 = otherwise
DATED1	1 = the survey interview took place in January; 0 = otherwise
DATED2	1 = the survey interview took place in February; 0 = otherwise
DATED3	1 = the survey interview took place in March; 0 = otherwise
DATED4	1 = the survey interview took place in April; 0 = otherwise
DATED5	1 = the survey interview took place in May; 0 = otherwise
DATED6	1 = the survey interview took place in June; 0 = otherwise
USEDPARK (Q4a)	1 = the respondent had used any of the parks in Northampton in the last twelve months; 0 = otherwise
NOPARKS (Q4b)	The number of parks which the respondent recalled visiting in the twelve months prior to the date of the survey
WALKING (Q5)	1 = used the park for walking; 0 = otherwise
PICNICKING (Q5)	1 = used the park for picnicking; 0 = otherwise
SPORT (Q5)	1 = used the park for organized sporting activity; 0 = otherwise
CHILDREN (Q5)	1 = used the park for outings with children; 0 = otherwise
VIEW (Q5)	1 = used the park for enjoying the view; 0 = otherwise
EVENTS (Q5)	1 = used the park for attending special events; 0 = otherwise
FLOWERS AND PLANTS (Q6)	1 = obtained most enjoyment from the flowers and plants in the parks; 0 = otherwise

OPEN SPACE (Q6)	1 = obtained most enjoyment from the open space in the parks; 0 = otherwise
PLAY AREA (Q6)	1 = obtained most enjoyment from the children's play areas in the parks; 0 = otherwise
PEACE&QUIET (Q6)	1 = obtained most enjoyment from the peace and quiet in the parks; 0 = otherwise
FACILITIES (Q6)	1 = obtained most enjoyment from the facilities available in the parks; 0 = otherwise
INTERVIEWER	1 = the respondent was interviewed by TC; 0 = interviewed by GJ
HWAYSD1 (Q1)	1 = thought spending on highways was about right; 0 = otherwise
HWAYSD2 (Q1)	1 = thought spending on highways was too little; 0 = otherwise
HOUSINGD1 (Q1)	1 = thought spending on housing was about right; 0 = otherwise
HOUSINGD2 (Q1)	1 = thought spending on housing was too little; 0 = otherwise
RECD1 (Q1)	1 = thought spending on recreation and tourism was about right; 0 = otherwise
RECD2 (Q1)	1 = thought spending on recreation and tourism was too little; 0 = otherwise
REFUSED1 (Q1)	1 = thought spending on refuse collection was about right; 0 = otherwise
REFUSED2 (Q1)	1 = thought spending on refuse collection was too little; 0 = otherwise
PARKSD1 (Q1)	1 = thought spending on parks was about right; 0 = otherwise
PARKSD2 (Q1)	1 = thought spending on parks was too little; 0 = otherwise

Notes: ^a Where appropriate, the question from which the variable was obtained is given in brackets. ^b All dummy variables were coded in this way. ^c Although not shown on the survey document, the question on this characteristic was put to respondents immediately after that on income category in Q19.

CHAPTER 8

ESTIMATION FROM

THE DICHOTOMOUS CHOICE CONTINGENT VALUATION FORMAT ¹

8.1 Introduction

The responses to the bid levels put to respondents form the basis of the analysis reported on in this chapter, which also represents the heart of the results in this thesis. The analysis is broadly similar to that employed on the data from the pilot, although the improved quality and quantity of the data in the main survey meant that it was possible to take it further. In particular, it proved viable to use more of the range of explanatory variables² available and to provide a more extensive analysis of mean WTP.

The additional procedures adopted in the main survey led to consideration of additional methodological issues relevant to application of the logit analysis in the CVM. These are discussed in the next section. The results obtained are then reported and the explanatory variables highlighted by the analysis are investigated for what they reveal about the determinants of accepting a bid put to respondents. Following this, estimates of mean WTP for the parks in Northampton are derived both from the logit results and applications of two non-parametric methods for estimation of mean WTP suggested by Kriström (1990) and Haab and McConnell (1997). The chapter concludes with policy issues raised by the results.

8.2 Further Methodological Considerations

Appendix 5.2 showed the derivation of the result, due to Hanemann (1984) and Cameron (1988), that once the coefficients in a logit regression are estimated in a standard regression package, an estimate of mean WTP ($E(WTP)$) could be made from the expression:

$$E(WTP) = a/\beta$$

where a is the absolute value of the constant term in a logit regression and β the value of the coefficient on the bid term in the regression.

This result is important because it means that interpretation of the logit results from CV surveys is not limited simply to a consideration of probabilities, as Liao (1994) suggests is often the case in other applications of this econometric approach.

Although probabilities can, as in this chapter, be considered when using the CVM, the role that a logit function can play in measuring mean WTP adds to its usefulness in the method.

A problem, however, with the approach of Hanemann and Cameron is that it assumes the bid values in the elicitation format are both positive and negative. In this, as in many other CV studies, the possibility of negative bid values (which could be interpreted as a willingness to accept some compensation for a change) was

removed by excluding from the bid procedure, using Q9b or Q10e in the survey, those respondents who were not prepared to pay any extra Council Tax.

Haab and McConnell (1997) have pointed to the lack of consensus for handling negative WTP, despite numerous attempts to resolve the problem. Hanemann (1989), for example, later amended his original formula to take account of this effect to:

$$E(WTP) = 1/\beta \ln[1 + \exp(a)]$$

where WTP covered the range of zero to infinity, and

$$E(WTP) = 1/\beta \ln[(1 + \exp(a))/(1 + \exp(a - \beta A^{\max}))]$$

where WTP covered the range of zero to the maximum bid A^{\max} .

The former has regularly been used in CV studies to estimate mean WTP and it is used here.

Also adopted is the approach of Buckland et al (1996), who suggest that, where the logistic curve representing the cdf of the bid values is truncated at zero the appropriate expression for mean WTP becomes:

$$m_1 = \int_0^{\infty} xf(x) dx \quad (8.1)$$

where, $f(x) = \frac{-b \exp-(a + bx)}{[1 + \exp-(a + bx)]^2}$;

m_1 is the mean WTP of those willing to consider making positive payments of the payment vehicle;

$\exp(\cdot)$ is the exponential operator;

x is the bid level with which the respondent is presented in the survey;

and a and b are, respectively, estimates of the coefficients α and β in the logit function.

The term $f(x)$ is the pdf of those respondents willing to pay a positive amount and is obtained by differentiating the expression:

$$\Pi = 1/[1 + \exp-(a + bx)] \quad (8.2)$$

where Π is the probability that a respondent will give a positive response to a bid level.

As explained in Appendix 5.2, equation (8.2) is the routine form of the logistic distribution's cdf. The expression in equation (8.1) is, therefore, the usual one for the mean of a continuous random variable with a pdf $f(x)$. When negative bid values are possible, the estimated coefficients a and b from the logit regression can be used in equation (8.1) to arrive at a point estimate of m_1 , the mean WTP. Given the nature of equation (8.1), the figure for mean WTP is calculated using numerical integration of the expression in the equation.

As mean WTP estimated by m_1 ignores respondents who have not been prepared to pay anything, Buckland et al (1996) suggest that the effect of this group is allowed for by using the expression:

$$m_0 = (1 - \tau)m_1$$

where, τ is the proportion of respondents not prepared to pay any extra Council Tax; and m_0 is an estimate of the mean WTP of all respondents.

Confidence intervals for the mean WTP can be arrived at using the delta method suggested by Seber (1982). For m_0 the relevant expression for the variance is given by Buckland et al (1996) as:

$$\text{var}(m_0) = (1 - \tau)^2 \text{var}(m_1) + (m_1)^2 \text{var}(\tau) + \text{var}(m_1)\text{var}(\tau) \quad (8.3)$$

where, $\text{var}(\cdot)$ is the estimate of the variance of the variable;

and $\text{var}(\tau) = \tau(1 - \tau)/n$, n being the total number of respondents.

The expression for the variance of m_1 in equation (8.3), again given by Buckland et al (1996), is:

$$\begin{aligned} \text{var}(m_1) = & \text{var}(b) \left[\int_0^{\infty} \frac{xu[(bx-1)-(bx+1)u]}{(1+u)^3} dx \right]^2 + \text{var}(m) \left[\int_0^{\infty} \frac{b^2xu(u-1)}{(1+u)^3} dx \right]^2 \\ & + 2\text{cov}(b,m) \left[\int_0^{\infty} \frac{xu\{(bx-1)-(bx+1)u\}}{(1+u)^3} dx \right] \left[\int_0^{\infty} \frac{b^2xu(u-1)}{(1+u)^3} dx \right] \end{aligned}$$

where: $m = -a/b$;

$\text{cov}(.)$ is the estimate of the covariance;

$$\text{var}(m) \simeq \frac{a^2\text{var}(b) + b^2\text{var}(a) - 2ab\text{cov}(a,b)}{b^4};$$

$$\text{cov}(b,m) \simeq \frac{a\text{var}(b)}{b^2} - \frac{\text{cov}(a,b)}{b};$$

and $u = \exp-(a+bx)$.

As with estimation of m_1 , this variance is calculated by numerical integration.

The variance of m_0 permits derivation of confidence intervals for the mean WTP using the expression of Burnham et al (1987) for the lower and upper limits of the interval. These are respectively:

$$(m_0/k, m_0k),$$

where $k = \exp[z_v \sqrt{\text{var}(\ln m_0)}]$,

$$\text{var}(\ln m_0) = \ln \left[1 + \frac{\text{var}(m_0)}{(m_0)^2} \right],$$

and z_v is the appropriate value from the standardized normal probability distribution for the $(100 - 2v)\%$ confidence interval.

The above provides an overview of some formulations used to calculate mean WTP from logit analysis of CV survey results. As will be discussed in Section 8.5,

modifications are possible, but all adopt the same general approach as here. Before discussing mean WTP, however, the logit analysis of the survey results are presented in Sections 8.3 and 8.4.

8.3 Logit Analysis of the Principle of Paying Extra Council Tax

Initial use of the logit approach with the data from the main survey involved analyzing responses to the questions concerning willingness to pay extra Council Tax (Q9b or Q10e), in a manner similar to that of Bullock and Kay (1997). In their study, they asked respondents if they were ‘in principle’ prepared to pay for policies that reduced grazing levels in the Central Uplands of Southern Scotland, before then putting to them a bid question if they did agree to the principle of extra payment. Their value elicitation procedure was, therefore, equivalent to that used in the main survey. They went on to use responses to this ‘payment-in-principle’ question, since they were dichotomous, as the dependent variable in a logit analysis that identified those variables which determined the probability that a respondent would agree to the principle of paying. Le Goffe (1995) did something similar.

When this procedure was employed using data from the main survey the models given in Table 8.1 followed.³ Of the three, Model (3) represents the best fitting in terms of the AIC and pseudo-R² measures. The other two models are presented because they suggest intriguing results and use all 209 available observations in giving a set of explanatory variables that are both individually and jointly

Table 8.1: Explaining WTP Extra Council Tax

Dependent variable: PAYMENT IN PRINCIPLE

<i>Independent variables</i>	<i>Model (1)</i>	<i>Model (2)</i>	<i>Model (3)</i>
Constant	-0.89666 ^c (-1.775) ^d	-1.7445 ^a (-3.141)	3.4825 ^a (3.985)
INTERVIEWER	0.98995 ^b (2.482)	1.0072 ^b (2.252)	
UNEMP	-1.7420 ^b (-2.144)		
NOQUAL	-1.0816 ^a (-2.979)		-1.9089 ^a (-3.061)
USEDPARK	0.81739 ^b (2.013)	0.79825 ^b (2.012)	
INCOME		0.00002718 ^c (1.916)	
NOHHOLD			-0.6871 ^a (-3.105)
SPORT			1.2688 ^b (1.965)
TECHNICAL			12.464 (0.050)
RESIDENCE			-0.0345 ^b (-2.228)
Q7D4 ^e			2.2657 ^b (1.974)
Q7D13 ^e			-13.573 (-0.044)
Number of observations	209	199	105
Log-likelihood function:	-127.9291	-128.4796	-47.2171
Restricted log-likelihood	-143.3690	-136.6042	-66.1193
Chi-squared statistic	30.8796 ^a	16.2491 ^a	37.8044 ^a
Pseudo-R ²	0.1077	0.0595	0.2859
AIC	1.2625	1.3214	1.0327
% successful predictions from the model	64.6	63.3	77.1

Notes: ^a Significant at the 1% level. ^b Significant at the 5% level. ^c Significant at the 10% level.
^d t-statistics for individual coefficients are given in brackets. ^e These variables also appeared in Model (4) of Table 7.2.

significant. These two models did not employ all the variables in Appendix 7.1 as a full set of observations was not available for a number of them.

In Model (1) the explanatory variables match those in the tobit analysis in that there is evidence of interviewer bias and the unemployed are less likely to be prepared to consider paying extra Council Tax. The signs on the other two variables, NOQUAL and USED PARK, are in line with expectations. Those without formal qualifications are less likely to agree to pay extra Council Tax⁴ and those who have used the parks are more likely. Model (2) confirms the problem with interviewer bias and the relationship between agreeing to pay extra Council Tax and actually using the parks. The model also includes the income variable, which suggests that those on higher incomes are more likely to be prepared to pay extra Council Tax. As discussed below, however, the opposite relationship occurs when it comes to using responses to bid levels as the dependent variable in a logit framework.

Model (3) in Table 8.1 has a number of features, apart from being the model with the best fit. It confirms the result on the place of educational qualifications as an explanatory variable found in Model (1). Additionally, it provides other variables to explain a decision to accept the principle of paying extra Council Tax. Of these, the idea that those who use the parks for sporting activity would be more likely to agree to this principle is, perhaps, not surprising. Less explicable, maybe, is the sign on the coefficient for the variable RESIDENCE, which suggests that those who have lived in Northampton longer would be less likely to agree to pay extra.

The results on the variables Q7D4 and Q7D13 in Model (3) confirm an earlier tobit model (Model (4) in Table 7.2). The discussion at that time, therefore, which suggested that the signs on the coefficients for these variables are what might be expected, remains valid. The negative relationship found for the variable NOHHOLD could be explained by smaller households living in flats or smaller houses without gardens. Parks would, therefore, be of more value to this group as they provide space not required by larger households living in larger houses.

The policy suggestions that follow from the above results are discussed in Section 8.8. What cannot be derived from them, however, is the value that the parks have in terms of WTP. To do this, logit analysis needs to be applied using the bid levels put to respondents and the responses to those bid questions. This is done in the next section.

8.4 Logit Analysis of Responses to Bid Questions

In common with practice in other studies where a screening question was employed in the value elicitation format⁵, this form of the logit analysis was conducted using observations where there was a positive response to the idea of making a payment. This meant 142 respondents were actually presented with a bid value in the elicitation format after agreeing to pay some extra Council Tax to maintain park provision.⁶

The initial part of the analysis involved estimation of a logit model with the bid value as the only explanatory variable. The results of this estimation, which are important for determining mean WTP in Section 8.5, are given in Table 8.2. The coefficients reported in the table are estimates for this survey of the coefficients a and b in equation (8.1). The coefficient on the bid value in Model (1) is statistically significant and its sign is, as expected, negative. As the bid value rises, therefore, the log of the odds ratio will fall.

As in the pilot survey (see Section 5.5), investigation then turned to other significant explanatory variables. Table 8.3 identifies logit models where variables were statistically significant. In identifying these variables, the actual bid value was retained in the specifications and single variables were added to determine both the individual significance of the variable and the joint significance of the variable and the bid level. Apart from the variables in Table 8.3, the other explanatory variables in the Appendix 7.1 to Chapter 7 were used.⁷ Although in most cases likelihood ratio tests showed them to be jointly significant when taken together with the bid value, none proved significant⁸ when a likelihood ratio test of individual coefficient significance was performed using the log-likelihood function from the model in Table 8.2, which includes the bid value, as the value of the restricted log-likelihood function.⁹

Likelihood ratio tests were also carried out for all the variables reported in Table 8.3 using the log-likelihood function in Table 8.2 as the restricted log-likelihood function when the model in Table 8.2 was nested in the model under consideration.

Table 8.2: Logit model for those agreeing to pay more Council Tax

Dependent variable: RESPONSE TO BID

Variable

Constant	(a)	2.2236 ^a (5.115) ^b
BID	(b)	-0.040649 ^a (-5.317)
Number of observations		142
Log-likelihood function		-79.05133
Restricted log-likelihood		-98.41281
Likelihood ratio statistic		38.72296 ^a
Pseudo-R ²		0.19674
AIC		1.1275
Percentage successful predictions from the estimated model		71.8

Estimates of variances and covariance for estimated coefficients

Model (1)

	Constant (a)	BID (b)
Constant (a)	0.18894	
BID (b)	-0.0029742	0.000058444

Notes : ^aSignificant at the 1% level. ^b t-statistics are given in brackets.

When this was not the case because of missing observations, a separate regression for the appropriate observations created a restricted form of the model that included the bid value and restricted the coefficients on the other explanatory variables to zero.

Table 8.3: Multivariate models obtained from Logit Analysis

Dependent variable in all models = RESPONSE TO BID

Variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Constant	2.953 ^a (4.904) ^d	3.9583 ^a (4.426)	.3569 ^a (4.064)	5.5676 ^a (4.035)	7.2573 ^a (4.130)	2.0997 ^a (4.581)
BID	-0.040639 ^a (-5.146)	-0.042194 ^a (-5.170)	-0.036641 ^a (-4.035)	-0.043398 ^a (-4.168)	-0.05778 ^a (-4.201)	-0.044605 ^a (-5.262)
INCOME	-0.000038205 ^b (-2.003)	-0.0001631 ^b (-2.131)		-0.00021622 ^b (-2.109)	-0.00027384 ^b (-2.305)	
INCOMESQ		0.31x10 ^{-8c} (1.703)		0.46x10 ^{-8c} (1.937)	0.53x10 ^{-8b} (1.972)	
NOHHOLD			-0.41603 ^b (-2.064)	-0.37545 ^c (-1.751)	-0.58607 ^b (-2.427)	
DATED4					3.7136 ^b (2.982)	1.8552 ^b (2.351)
DATED3						1.8635 (2.299) ^b
n ^e	136	136	91	90	90	142
LL function	-73.76949	-72.26714	-50.48125	-46.00583	-39.52981	-73.23181
Restricted LL	-94.25331	-94.25331	-62.40993	-61.58086	-61.58086	-98.41281
LR statistic	40.96765 ^a	43.98315 ^a	23.85735 ^a	31.15006 ^a	44.1021 ^a	50.3620
Pseudo-R ²	0.21733	0.23332	0.191134	0.25292	0.35808	0.25587
AIC	1.11426	1.10688	1.15343	1.11124	0.98955	1.07369
%successful predictions	72.79	72.06	72.53	71.11	81.11	71.13

Notes: ^a Significant at 1% level. ^b Significant at 5% level. ^c Significant at 10% level. ^d t-statistics for individual coefficients are given in brackets. ^e n = number of observations.

This process gave Model (5) in Table 8.3, which provides a set of explanatory variables that are individually and jointly significant.¹⁰ It is also a model that, compared to the others shown, has higher values for the pseudo- R^2 statistic and the percentage of successful predictions from the estimated model and a lower value for the AIC. The reduced number of observations upon which the model and Models (3) and (4) are predicated reflects missing data on the number of persons in a respondent's household. Model (6) suggests that, in some specifications, DATED3, the dummy for interviews conducted in March, was significant. When added to the variables in Model (5), however, it is insignificant, causing it to be omitted from that model. The signs on the coefficients for the various explanatory variables are also constant across the models in Table 8.3.

Each of the explanatory variables identified in Model (5) are now investigated in more detail. To begin, the model suggests a non-linear relationship between income and the log of the odds ratio, a conclusion derived from the significance of the coefficient on INCOMESQ. This is a standard case of a model that is linear in the parameters but non-linear in the variables. The signs of the coefficients on INCOME and INCOMESQ suggest that the quadratic function has a minimum, as there is a negative sign on the INCOME coefficient and a positive coefficient for income squared. The income where the minimum comes is given by the expression $-c/2d$, where c is the value of the coefficient on INCOME and d that on INCOMESQ.¹¹

For Model (5), the estimated turning point for the quadratic function linking the log of the odds ratio and income comes when income equals £25 824. Below this

income, the results would suggest, parks are an inferior good for which WTP declines with income. Above it, the results imply, parks are normal goods. When the figure for the minimum value of the quadratic function is compared with the mean income of £18 440 for the 90 respondents included in the regression and an upper value for household income assumed for respondents at £37 500, it falls within the range of recorded observations. This would suggest that the quadratic function is a good representation of the relationship between the income variable and the logit.¹²

The result is tempered, however, by testing for the significance of the slope of the quadratic function at different incomes. The test used a t-statistic for the slope of the function at a number of income levels. This slope is given by the expression $c + 2d(\text{INCOME})$.¹³ Table 8.4 shows the t-statistic for the slope of the function calculated for incomes from £2500 to £900 000. The second column in Table 8.4 shows that income does not have a constant impact on the dependent variable, further evidence of the quadratic nature of the income variable in the logit regression.

The t-statistics show that only at incomes up to £20 000 is the slope statistically significant and that income is, therefore, only an explanatory variable for the log of the odds ratio at these levels. Whilst the conclusion that parks are an inferior good is substantiated for these levels of income, the identification of the turning point and the subsequent up-turn in the quadratic function are not confirmed by this testing procedure. Only at very high levels of income (above £60 000) is the variable statistically significant again. As these values are outside the range of collected data,

Table 8.4: t-statistics for a Test of the Significance of Income at Various Income Levels

<i>Income (£)</i>	<i>t-statistic</i>	<i>Marginal impact on logit of change in income (c + 2d INCOME)</i>
2 500	-2.3371 ^a	-0.0002473
5 000	-2.3750 ^a	-0.0002208
7 500	-2.4191 ^a	-0.0001943
10 000	-2.4687 ^a	-0.0001678
12 500	-2.5177 ^a	-0.0001413
15 000	-2.5409 ^a	-0.0001148
18 440 ^c	-2.3548 ^a	-0.00007827
20 000	-2.0501 ^a	-0.00006173
25 000	-0.2491	-0.000008700
25 834	0	0
30 000	0.8122	0.00004433
50 000	1.6391	0.0002564
60 000	1.7300 ^b	0.0003625
900 000	1.9621 ^a	0.009271

Notes: ^a Significant at the 5% level. ^b Significant at the 10% level. ^c Mean income for respondents in Model (5).

the suggestion that parks are normal goods for those at higher levels of income cannot be substantiated. The result may just be an artefact of modelling the relationship between the logit and income as a quadratic function.

This is not to say that plausible explanations cannot be found for this relationship. It has already been discussed in Chapter 5 how those on lower incomes presumably value the parks as a low-cost form of entertainment which more affluent residents can substitute with activities requiring immediate payment. The benefits that accrue to many high income-earners from owning properties near parks and the fact that the

value of many of these properties is enhanced by proximity to a park are likely to be important reasons for this group valuing parks more than those on middle incomes.

Income is also a significant explanatory variable in Models (1) and (2) in Table 8.3. These imply, following the approach in Gujarati (1992), estimated probabilities for respondents faced with a given bid level and having a certain income. To illustrate the effects here, Table 8.5 outlines for Models (1) and (2) the probabilities for the three bid levels used in the survey and the eight midpoint levels of income obtained from respondents. It confirms the quadratic relationship between the probability of accepting a bid and the level of income in that this probability rises after the turning point in the quadratic model.

The significance of the dummy variable DATED4 in Model (5) allows for interpretation of its coefficient. As Hosmer and Lemeshow (1989) show, where the explanatory variable is dichotomous, as here, the value of the coefficient on that variable can be interpreted directly as the natural logarithm of the odds ratio of the two possible outcomes associated with the dependent variable.¹⁴ The two possible outcomes in this case are either a positive or negative response to the bid level. This interpretation of the coefficient on DATED4 as the maximum likelihood estimate of the log-odds ratio means that the maximum likelihood estimate of the odds ratio is easily derived. In Model (5) of Table 8.3, therefore, the coefficient on DATED4 has a value of 3.7136, implying a value for the odds ratio of $\exp(3.7136) = 41.0011$. This indicates that respondents interviewed in April for the CV survey were

Table 8.5: Probability of Saying Yes to the Three Bid Levels used in the Survey for different income levels

<i>Income levels^a (£)</i>		<i>Bid Levels (£)</i>		
		25	50	100
2 500	Model (1)	0.86313	0.69541	0.23034
	Model (2)	0.92517	0.81153	0.34305
7 500	Model (1)	0.83900	0.65301	0.19822
	Model (2)	0.86438	0.68939	0.21208
12 500	Model (1)	0.81145	0.60909	0.16960
	Model (2)	0.79287	0.57137	0.13916
17 500	Model (1)	0.78048	0.56278	0.14437
	Model (2)	0.72816	0.48262	0.10163
22 500	Model (1)	0.71781	0.51535	0.12233
	Model (2)	0.68592	0.43199	0.08444
26 679 ^b	Model (1)	0.71458	0.47546	0.10620
	Model (2)	0.67430	0.41893	0.08041
27 500	Model (1)	0.67757	0.46765	0.10326
	Model (2)	0.67475	0.41943	0.08056
32 500	Model (1)	0.63450	0.42043	0.08686
	Model (2)	0.69662	0.44433	0.08840
37 500	Model (1)	0.58918	0.37481	0.07286
	Model (2)	0.74754	0.50767	0.11115

Note: ^a The midpoints of the income categories into which respondents were asked to place their income levels. ^b This is the turning point income in Model (2). As such, it is the level of income giving the lowest probability of accepting a particular bid level.

more than forty times as likely to respond positively to bid values as those not interviewed in April.

The standard error of the coefficient on the dummy variable allows calculation of a confidence interval for the odds ratio. The endpoints of the 95% confidence interval for the coefficient (b_0) are used to determine these values from the expression:

$$\exp [b_0 \pm 1.96 \text{ SE}(b_0)],$$

where $\text{SE}(b_0)$ is the standard error of the coefficient b_0 .

In this case, the endpoints would be given by the values 3.5709 and 470.7786. This confidence interval follows the pattern, identified by Hosmer and Lemeshow (1989), for situations where the point estimate of the odds ratio is greater than one in that it is skewed to the right.

The above results suggest that the timing of the survey had important effects on the probability of a positive response to a bid level. To test further for this effect six separate logit regressions were run for each of the months in which the survey took place. The regressions concerned only included the bid level as an explanatory variable. It was not possible to use the number in the household as a variable in this formulation as in some months insufficient observations were available to allow regressions to be run. Income was also shown to be statistically insignificant when included in the specifications for individual months and was, therefore, excluded as a variable. The results of these regressions are given in Table 8.6. It should be noted that they are based on a much smaller number of observations than previous models.

Table 8.6: Coefficients and Mean WTPs obtained for each month of the survey^d

Dependent variable in each case: RESPONSE TO BID

<i>Month</i>	<i>n^f</i>	<i>Constant</i>	<i>BID coefficient</i>	<i>Adjusted Mean WTP (£) ^e (Unadjusted Mean WTP)</i>
January	29	3.4062 ^a (2.2532) ^c	-0.096440 ^a (-2.4281) ^c	20.69 (35.66)
Log likelihood function = -11.46604				
February	27	4.0970 ^a (3.0129)	-0.066073 ^a (-2.8195)	45.43 (62.25)
Log likelihood function = -10.49866				
March	15	2.1404 (1.5787)	-0.014574 (-0.6764)	Not Reported
Log likelihood function = -7.282766				
April	14	3.0448 ^b (1.8317)	-0.032387 ^b (-1.5320)	66.81 (95.44)
Log likelihood function = -6.997281				
May	30	2.1942 ^a (2.2180)	-0.042790 ^a (2.2858)	41.34 (53.75)
Log likelihood function = -17.01000				
June	23	1.5493 ^b (1.2011)	-0.037513 ^a (-1.8082)	30.51 (46.43)
Log likelihood function = -12.66719				

Notes: ^a Significant at the 5% level. ^b Significant at the 10% level. ^c t-statistics are given in brackets.

^d Four observations for December 1995 have been excluded from these regressions. ^e Mean WTP was calculated using the approach of Buckland et al (1996) discussed in Section 8.2. ^f n = number of observations.

In all cases, the signs on the constant term and bid level were the expected ones.

Also, the regressions gave bid coefficients significant at least at the 10% level for all months except March. An idea of the way in which the timing of the survey affects the mean WTP is given by the figures reported in the final column. The fluctuations in these values for the different months is indicative of the impact of timing on respondents' valuation of parks.

The joint significance of the variables in the six regressions in Table 8.6 was tested for by totalling the log-likelihood functions from each of the regressions and performing a likelihood ratio test that used the log-likelihood function from a regression based on all 138 observations in Table 8.6 as the restricted form of the log-likelihood. The value of the latter log-likelihood function was -77.03261. The sum of the six log-likelihoods for each month's regression is -65.92194. These values give a likelihood ratio test statistic of 22.22135. The critical value at the 5% level of significance with 10 degrees of freedom is 18.3070. The null hypothesis that these month-by-month regressions are not statistically significant explanations of the log of the odds can, therefore, be rejected. Timing of the survey appears to have been a significant determinant of responses, a view confirmed by the ambiguity of the significance of the DATED3 variable in Table 8.3 and the presence of the variable DATED4 in Model (5).

The coefficient on the variable for the number in a household in Model (5), can, as Hosmer and Lemeshow (1989) show, be interpreted as the natural log of the odds ratio between the explanatory variable (number in the household) and the probability

that the respondent will say yes to a given bid value, if it is assumed to be continuous. Thus:

$$e = \ln [\psi(\delta \text{ NOHHOLD})] \Rightarrow \psi(\delta \text{ NOHHOLD}) = \exp(e)$$

where $\psi(\delta \text{ NOHHOLD})$ is the odds ratio for an increase of one in the size of the household and e is the coefficient on the variable NOHHOLD.

The relevant value of the coefficient in Model (5) is -0.58607, implying that $\psi(\delta \text{ NOHHOLD})$ is 0.5565. The result indicates that, assuming the values of the other explanatory variables are constant, every increase of one in the size of a household causes a respondent to be only 55% as likely to give a positive response as they would when their household was smaller by one. The endpoints of a 95% confidence interval for the odds ratio can in this case be estimated from the expression:

$$\exp[e \pm z_{1-\alpha/2} \text{SE}(e)]$$

where $z_{1-\alpha/2}$ is the appropriate value in the t-distribution for the chosen confidence interval and $\text{SE}(b_1)$ is the standard error of the coefficient for the number in the household, here equal to 0.24149.

The value of $z_{1-\alpha/2}$ for the 95% confidence interval with 90 degrees of freedom is 1.99. The lower and upper limits for this interval are respectively 0.34416 and 0.89987, so confirming the negative impact of number in the household on WTP.

Incorporating interaction terms (the product of two explanatory variables) in Model (5) would identify the extent to which the effect of one of the variables is dependent on the levels of another variable. For example, if there was interaction between the variables for number in the household and respondent income, this would suggest that the coefficient for income would vary with household size. Income would, therefore, have a different relationship with the probability of saying yes for each size of household and it would only be possible to interpret the coefficient on NOHHOLD as the log of an odds ratio by first specifying the level of income at which the comparison was being made between the number in the household and the probability that a respondent will say yes to a bid level.

Such effects were tested for by adding separately each of the interaction terms (the product of each possible pair of variables in Model (5)) to the model. The significance of these terms was tested for with a likelihood ratio test using the log-likelihood function reported in Model (5) as the log-likelihood for the restricted form of the model. The unrestricted form came from the new model that included the interaction term. As can be seen in Table 8.7, none of the interaction terms was significant at either the 5% or 10% level when this procedure was used.

Table 8.7: The Effect of Adding Interaction Terms to Model (5) in Table 8.3

<i>Interaction Term</i>	<i>Log-Likelihood from new specification</i>	<i>LR Test Statistic *</i>
BID*NOHHOLD	-39.42790	0.20382
BID*INCOME	-39.17783	0.35198
BID*INCOMESQ	-39.22869	0.60224
BID*DATED4	-39.26242	0.53478
NOHHOLD*INCOME	-39.49559	0.06844
NOHHOLD*INCOMESQ	-39.44149	0.17664
NOHHOLD*DATED4	-38.97282	1.11398
INCOME*INCOMESQ	-39.41374	0.23214
INCOME*DATED4	-39.45724	0.14514
INCOMESQ*DATED4	-39.32226	0.4151

Log likelihood function in Model (5) of Table 8.3 = -39.52981

Note: * In all cases the test statistic has a chi-squared distribution with one degree of freedom. The critical value at the 5% level of significance is 3.84146.

A final point to emerge from this analysis is the absence of interviewer bias. This contrasts with the results of the tobit analysis in Chapter 7 and those of Section 8.3, where the impact of the interviewer was consistently significant in various specifications. To obtain no significance in this case, is, therefore, a valuable outcome, as it creates confidence that the results on mean WTP, considered in the next section, are not subject to this form of bias. The above results also produced a number of policy suggestions. As for the previous section, these are examined in Section 8.8.

8.5. Determining Mean WTP

The values obtained from the logit results in Table 8.2 were first applied to the equation suggested by Hanemann (1989). The values for the coefficients a and b , the estimates of a and β , were taken from Table 8.2 such that $a = 2.2236$ and $b = -0.040649$.¹⁵ This gave a value for mean WTP of £57.23. Adjusted for non-respondents the value became £38.88 = £[57.23 * (142/209)].

Equation (8.1) was then used to estimate m_1 , the mean for those respondents willing to pay a positive amount of Council Tax to maintain the status quo for Northampton's parks. Numerical integration using the values of a and b produced an estimate of mean WTP for those willing to countenance an increase in Council Tax of £60.61. Adjusting for those who would not consider an increase in Council Tax using the expression $m_0 = (1 - \tau)m_1$, estimated mean WTP became £[60.61*(1 - 67/209)] = £41.18.

The expression for $\text{var}(m_1)$ in Section 8.2 gives a value, obtained by numerical integration, of 148.6411 for this identity. The value of the variance for m_0 obtained from equation (8.3) in Section 8.2 is equal to:

$$\begin{aligned} & ((142/209)^2 * 148.6411) + ((60.61)^2 * 0.0010421) + (148.6411 * 0.0010421) \\ & = 72.598911, \end{aligned}$$

the estimated variance of τ being $\frac{67/209 * 142/209}{209} = 0.0010421$.

As shown in Section 8.2, the variance of m_0 can be used to estimate confidence intervals for mean WTP. The value of k in the expression for the lower and upper limits of the 95% confidence intervals is 1.4938, yielding values for the lower and upper limits of the mean WTP measured by m_0 of £27.57 and £61.51 respectively.

As discussed in Section 7.2, the total WTP of the population of Northampton can be calculated in two ways. If the number of households (71 569) is used as the basis for the calculation of the total WTP, a total valuation of parks in Northampton of £2 947 211 is obtained from the estimated mean WTP of £41.18. The 95% confidence intervals for this estimate are £1 973 157 and £4 402 209.

If the population aged 18 and over is used (136 457), the total valuation of the parks of Northampton is £5 619 299 based on a mean WTP of £41.18. The 95% confidence intervals are £3 762 119 and £8 393 470. This latter method of estimating the total valuation of parks is the one applied to the other estimates of mean WTP which are now examined. All other total valuations are reported in Table 8.13, where an adjustment is also made for the effect of non-respondents.

Mean WTP can, as Buckland et al (1996) show, also be estimated using a logit regression with a logarithmic transformation of the bid value.¹⁶ The effect of this is similar to truncating the range of the numerical integration at zero in that it excludes the possibility of negative bid values. There can be problems with estimating mean WTP using this method as there may be a poor fit in the upper tail of the function assumed by the logarithmic transformation. To deal with this, Boyle et al (1988)

suggest using the highest bid level as the upper limit in the numerical integration. In this survey the nature of the value elicitation procedure suggested that a value of £150 would be appropriate for the upper limit, as this was the highest value obtained in response to Q14, the open-ended statement of WTP by respondents. Values from the regression with the log of the bid value reported in Table 8.8 allows estimation of mean WTP (m_1) by numerical integration at a value of £47.48. Adjusting to take account of respondents who did not wish to pay any Council Tax gives an estimate of m_0 equal to £32.26.

The variance of this mean WTP can be approximated by an amended version of the delta method suggested above.¹⁷ The value obtained in this case is 4517.369. From it is estimated, as before, the variance of m_0 :

$$\begin{aligned} & ((142/209)^2 * 4517.369) + ((47.48)^2 * 0.0010421) + (4517.369 * 0.0010421) \\ & = 2092.3626. \end{aligned}$$

Confidence intervals for mean WTP are calculated in the same way as for the mean with WTP truncated at zero. This time k 's value is 7.82746. The confidence intervals for mean WTP are thus £4.12 and £252.51.¹⁸

Mean WTP can also be estimated when negative bid values cannot be assumed using a reciprocal of the bid in the logit regression in addition to the bid value itself. The results obtained when this was done are given in Table 8.9. The reciprocal of the bid (RECBID) in this specification is not significant according to a likelihood ratio test

Table 8.8: Logarithm of the Bid as the Explanatory Variable

Dependent variable: RESPONSE TO BID

<i>Variable</i>	<i>Coefficient</i>
Constant	8.0464 ^a (a) (5.275) ^c
LOGBID ^b	-2.0706 ^a (b) (-5.294)
Number of observations	142
Log likelihood function	-80.58161
Restricted log likelihood	-98.41281
Likelihood ratio statistic	35.66241 ^a
Pseudo-R ²	0.18119
AIC	1.14904
Percentage of successful predictions from the estimated model	66.2

Estimates of variance and covariances for estimated coefficients

	Constant	LOGBID
Constant	2.3268	
LOGBID	-0.59191	0.15299

Note: ^a Significant at the 1% level. ^b The variable is the natural logarithm of the bid levels defined in Appendix 7.1 to Chapter 7. ^c t-statistics are given in brackets.

of the coefficient for this variable. Also, using the values given by the regression in Table 8.9, it did not prove possible to estimate mean WTP using the approach suggested by Buckland et al (1996).¹⁹

The final estimate of mean WTP from the logit regression can be derived using Model (5) in Table 8.3. The explanatory variables are used to estimate mean WTP by adjusting the coefficients in the formula for mean WTP to reflect the mean value of the explanatory variables. This gives a new value for the constant term to be used

Table 8.9: Bid and the Reciprocal of the Bid as Explanatory Variables in a Logit Regression

Dependent variable: RESPONSE TO BID

<i>Variable</i>	<i>Coefficient</i>
Constant	3.1871 ^a (a) (1.7673) ^c
BID	-0.049182 ^a (b) (-2.8233)
RECBID ^b	-21.472 (e) (-0.5535)
Number of observations	142
Log likelihood function	-78.89806
Restricted log likelihood	-98.41281
Likelihood ratio statistic	39.02951 ^a
Pseudo-R ²	0.19829
AIC	1.1394
Percentage of successful predictions from the estimated model	71.8

Estimates of variance and covariances for estimated coefficients

	Constant	BID	RECBID
Constant	3.2521		
BID	-0.030301	0.00030347	
RECBID	-67.921	0.60489	1505.2

Notes: ^a Significant at the 1% level ^b The variable is the reciprocal of the bid levels defined in Appendix 7.1 to Chapter 7. ^c t-statistics are given in brackets.

in re-estimating mean WTP. The calculation of this figure for Model (5) is given in Table 8.10.

When the value for the constant term in Table 8.10, a linear function of the various explanatory variables, is used in equation (8.1) with the coefficient on the bid term from Model (5) the point estimate of mean WTP was £65.94. Allowing for those

Table 8.10: Calculation of the ‘Constant Term’ for Estimating Mean WTP in the presence of explanatory variables in the logit function

<i>Explanatory variable</i>	<i>Value of Coefficient in Model (5) [1]</i>	<i>Mean Value of Explanatory Variable [2]</i>	<i>Value for Constant Term ([1] x [2])</i>
INCOME	-0.00027384	18440	-5.0496096
INCOMESQ	0.53x10 ⁻⁸	469000000	2.4857
NOHHOLD	-0.58607	2.533	-1.48451531
DATED4	3.7136	0.1444	0.53624384
CONSTANT	7.2573	1	7.2573
<i>‘Constant term’ for estimating mean WTP =</i>			3.74512

respondents who did not wish to pay any extra Council Tax, estimated mean WTP was £44.80.

To obtain confidence intervals for this estimate of mean WTP, it is necessary to find the variance of the new constant term as well as the covariance between this term and the coefficient on the bid value in Model (5). As the constant term is a linear combination of a number of independent random variables, standard rules for calculating the variances and covariances of such variables can be used.

The variance of the constant term is thus given by the expression:

$$\begin{aligned} &\text{var(a)} + (\text{MINCOME})^2 \text{var(c)} + (\text{MINCOMESQ})^2 \text{var(d)} + (\text{MNOHHOLD})^2 \\ &\text{var(e)} + \text{MDATED4}^2 \text{var(f)} + [\text{sum of covariance terms}]^{\text{note 20}} \end{aligned}$$

where a, c, d, e and f are the coefficients on the explanatory variables in Model (5) and MINCOME, MINCOMESQ, MNOHHOLD and MDATED4 are the mean values of these variables, given in Table 8.10. Evaluating this expression gives a value for the variance of the constant term of:

$$\begin{aligned}
 & 3.0884 + [(18440)^2 * 0.000000014117] + [(469000000)^2 * (0.72306 * 10^{-17})] + \\
 & [(2.533)^2 * 0.058319] + [(0.1444^2 * 1.5509)] + [\text{sum of covariance terms}] \\
 & = 0.781049
 \end{aligned}$$

The covariance between the constant and the coefficient on the bid value in Model (5) is given by the expression:

$$\begin{aligned}
 & \text{cov}(a,b) + \text{MINCOME} * \text{cov}(b,c) + \text{MINCOMESQ} * \text{cov}(b,d) + \\
 & \text{MNOHHOLD} * \text{cov}(b,e) + \text{MDATED4} * \text{cov}(b,f).
 \end{aligned}$$

When evaluated this is:

$$\begin{aligned}
 & 0.00018921 + [18440 * 0.000000075241] + [469000000 * (-0.15402 * 10^{-10})] + \\
 & [2.533 * 0.0010517] + [0.1444 * (-0.010076)] \\
 & = 0.008049094.
 \end{aligned}$$

Var (m) used in evaluating the variance of mean WTP with covariates is now given by the expression in Section 8.2 but evaluated using the values from Model (5).

Thus, var(m) comes to:

$$\frac{[(3.74511893)^2 * 0.00018921] + [(-0.05778)^2 * 0.781049] - [2 * 3.74511893 * -0.05778 * 0.008049094]}{(-0.05778)^4}$$

$$= 784.596477$$

Similarly, cov(b, m) is now evaluated as:

$$\frac{3.74511893 * 0.00018921}{(-0.05778)^2} - \frac{0.008049094}{-0.05778}$$

$$= 0.351559.$$

As before, numerical integration is used to estimate the variance of m_1 , which, in turn, gives the estimated variance of m_0 . The variance of m_1 determined in this way is 1765.7375 and that of m_0 is:

$$((142/209)^2 * 1765.73745) + ((65.94)^2 * 0.00104214) + (1765.73745 * 0.00104214) = 821.47024.$$

This value gives the 95% confidence interval for mean WTP with k equal to 3.15203. The lower and upper limits for the confidence interval are then £14.21 and £141.21.

Estimation of mean WTP can also take place using non-parametric methods. In Section 8.6, two such methods are used to complement the results derived from the logit analysis.

8.6 Non-Parametric Estimation

The estimation of mean WTP using the logit approach is dependent upon the assumption that the error function is distributed as a logistic function. If this is wrong, then the resultant estimates of mean WTP can, as Creel and Loomis (1997) suggest, be biased and inconsistent. To overcome this problem, interest has grown amongst CV researchers in nonparametric estimators of mean WTP that will provide consistent estimates, although these will be less efficient than well specified parametric models. In this section, the approaches proposed by Kriström (1990) and Haab and McConnell (1997) are applied.

The method due to Kriström (1990) involves creating an Ayer curve (or survival function) by plotting the proportion of respondents saying yes to each bid level against the value of the bids. The curve can be constructed, as Kriström (1990) suggests, from linear interpolation between the points on the graph. The mean WTP is then determined by calculating the area below the constructed curve. Ozuna et al (1993) have used this method to compare estimates from parametric and non-parametric approaches. Where there is no difference between the results obtained from these two approaches, there can be confidence that misspecification in the logit regressions are not going to bias the estimates of mean WTP.

Nonparametric estimators, therefore, are a baseline against which other estimates of mean WTP can be assessed.

A problem that can arise with Kriström's approach is that any functional form chosen to link the points of the Ayer curve is arbitrary. Different functions, therefore, give different estimates of WTP. Difficulties also emerge if no bid value has a zero proportion saying yes. In these cases, the point where the survival function intersects the bid value axis must be estimated to allow mean WTP to be calculated. A final difficulty, which applies equally to the method of Haab and McConnell (1997), is that nonparametric estimators do not provide explanatory variables. If these are required by the demands of the study, then parametric methods, such as the logit, are needed.

In this survey, data from Table 6.10, which give the proportions answering yes to the three bid levels in the survey, were used and, as suggested by Kriström (1990), linear interpolation between the plotted points was employed. Three estimates of mean WTP were then made using three values for the intercept term of £100, £113.47 and £150. £100 represented a conservative lower bound on estimated mean WTP using this method, as it was the highest bid value put to respondents in the survey. It was, in fact, accepted by 13.9% of respondents. £113.47 resulted from a linear extrapolation of the survival function between the co-ordinates (0.655, £50) and (0.139, £100). £150 was the maximum WTP volunteered in response to the question in the survey (Q14) requesting the most a respondent would be prepared to pay above the bid value with which they had been presented. These values give three point estimates of mean WTP equal to £55.79, £56.72 and £59.26 respectively. Adjusted for the proportion saying no to the question about paying Council Tax

yields estimates of £37.90, £38.53 and £40.26. This approach, therefore, corroborates the results of the logit method.

The approach of Haab and McConnell (1997) employs a Turnbull estimator based on the proportion of those giving negative responses to a bid level. These values are used to construct the Turnbull cdf and pdf. Thus, if, as in the main survey, 25% say no to a bid level of £25, this implies that the probability that WTP falls between zero and £25 is 0.25. This, therefore, gives the value of the cdf at £25. The process can be repeated for other bid levels provided the proportions saying no are monotonic in relation to the bid level. If this condition does not apply, then the responses from two contiguous bid ranges are pooled in the manner shown by Haab and McConnell.

This procedure was not required on the data in the main survey. The pdf is constructed from the cdf using the relationship:

$$P(A_{j-1} < WTP < A_j) = F(A_j) - F(A_{j-1})$$

where A_j is a bid level;

A_{j-1} is the previous, lower, bid level in the bid vector;

$P(\cdot)$ is the probability of an event; and

$F(\cdot)$ is the cdf of WTP evaluated at a bid level.

The relevant values for the Turnbull cdf and pdf from the main survey are given in Table 8.11.

Table 8.11: Turnbull cdf and pdf

<i>Bid range WTP</i>	<i>Turnbull cdf</i>	<i>Turnbull pdf</i>
0-25	0.250 ^a (0.0625) ^b	0.250 (0.0625) ^c
25-50	0.426 (0.0673)	0.176 (0.0918)
50-100	0.875 (0.0523)	0.449 (0.0852)
100+	1	0.125 (0.0523)

Notes: ^a The proportions for no responses are one minus the proportions for yes responses given in Table 6.10. ^bStandard errors are given in brackets. ^c The variance of probabilities in the pdf is given by the expression $\frac{F(A_j) [1 - (F(A_j))]}{n_j} + \frac{F(A_{j-1}) [1 - (F(A_{j-1}))]}{n_{j-1}}$.

From this table, the mean and variance of WTP can be calculated using the expressions:

$$E(WTP) = \sum_{j=1}^{M+1} A_{j-1} P(A_{j-1} < WTP < A_j)$$

$$Var(WTP) = \sum_{j=1}^{M+1} A_{j-1}^2 [Var (F(A_j)) + Var(F(A_{j-1}))] - 2 \sum_{j=1}^{M+1} A_j A_{j-1} Var(F(A_j))$$

where M is the number of bids in the bid vector;

A₁ is the value of the lowest bid in the bid vector;

A_M is the value of the highest bid;

$$\text{Var} (F(A_j)) = \frac{F(A_j) (1 - (F(A_j)))}{n_j} ; \text{ and}$$

n_j is the number of respondents presented with bid level A_j .

The Turnbull estimator provides a lower bound on mean WTP because of the conservative procedure of attaching the probability of the bid range (A_{j-1} to A_j) to the lowest value in the range (A_{j-1}). Harrison and Kriström (1995) call this the minimum legal WTP, although one which, as Haab and McConnell (1997) show, depends upon the bid vector employed. This estimator also has the not inconsiderable advantage of computational simplicity.

The value for mean WTP obtained from applying the Turnbull estimator to the figures in Table 8.11 was £39.25. The variance equalled 12.107 so giving values for the limits of the 95% confidence interval for mean WTP of £32.43 and £46.07.

When adjusted for the effect of those not prepared to consider paying extra Council Tax the figure for mean WTP is £26.67 with a 95% confidence limits of £21.41 and £31.93. These values are clearly at the bottom end of the range for WTP estimates, thereby confirming the estimator's conservative nature.

8.7 Assessing the Estimates of Mean WTP

Table 8.12 summarizes the measures of mean WTP that have been established for parks in Northampton using the methods above. Table 8.13 gives the total valuations

Table 8.12: Measures of Mean WTP for Parks in Northampton

<i>Method</i>	<i>Estimate of m_1 (£)</i>	<i>Estimate of m_0^a (£)</i>	<i>95% CI for m_0 (£)</i>	<i>Proportionate variance ^b</i>
<i>Parametric</i>				
Hanemann (1989)	57.23	38.88	(31.50, 41.26) ^d	0.0968
Truncation at zero	60.61	41.18	(27.57, 61.51)	0.2069
Log transformation of bid	47.48	32.26	(4.12, 252.51)	2.0834
Explanatory variables included with bid level	65.94	44.80	(14.21, 141.20)	0.6398
<i>Non-parametric</i>				
Kriström (1990)				
Intercept = £100	55.79	37.90	N.A. ^c	
Intercept = £113.47	56.72	38.53	N.A.	
Intercept = £150	59.26	40.26	N.A.	
Turnbull	39.25	26.67	(21.41, 31.93)	0.1007

Notes: ^a In all cases $m_0 = (142/209) \cdot m_1$. ^b The standard deviation divided by the mean. It is a measure of the degree of precision of the estimate. ^c Not applicable. ^d Calculated using the delta method.

of the parks derived from these estimates. It includes two estimates of population WTP, the first, shown as Estimate I, is based on the principle of the sample representing the total population. The second, Estimate II, is calculated using the “very conservative practice”, as Champ et al (1997) call it, of assuming that all non-respondents had a zero valuation. All the estimates are conservative to a degree when it is recalled that the sampling procedure excluded those from outside Northampton, but of them, the most conservative point estimate of total WTP is that given by Turnbull Estimate II at a value of £1 837 235.

Table 8.13: Estimates of the Total Value of Northampton's Parks

<i>Method for estimating mean WTP</i>	<i>Total valuation^a (£)</i>	<i>95% confidence intervals (£)</i>	
		<i>lower limit</i>	<i>upper limit</i>
<i>Parametric</i>			
Hanemann (1989)			
Estimate I ^c	5 305 448	4 298 494	6 312 402
Estimate II ^d	2 678 354	2 170 013	3 186 696
Truncation at zero			
Estimate I	5 619 299	3 762 119	8 393 470
Estimate II	2 836 796	1 899 234	4 237 283
Log transformation of bid			
Estimate I	4 402 103	562 203	34 456 757
Estimate II	2 222 317	283 817	17 394 841
Explanatory variables with bid level			
Estimate I	6 113 274	1 939 054	19 269 093
Estimate II	3 086 169	987 894	9 727 634
<i>Non-parametric</i>			
Kriström (1990)			
<i>Intercept = £100</i>			
Estimate I	5 171 720	N.A. ^b	N.A
Estimate II	2 610 844	N.A	N.A
<i>Intercept = £113.47</i>			
Estimate I	5 257 688	N.A	N.A.
Estimate II	2 651 243	N.A	N.A
<i>Intercept = £150</i>			
Estimate I	5 493 759	N.A	N.A
Estimate II	2 773 419	N.A	N.A
Turnbull			
Estimate I	3 639 308	2 921 304	4 357 312
Estimate II	1 837 235	1 474 765	2 199 706

Notes: ^a In all cases m_0 is used to estimate the total valuation. The population of Northampton, as before, is taken to be 136 457. ^b Not applicable. ^c Assumes the sample is representative of the total population. ^d Assumes all non-respondents had a zero valuation for parks.

In Table 8.12 the point estimates are relatively closely clustered. As in most CV studies, however, the 95% confidence intervals are wide. This is particularly the case when the logarithm of the bid is used to estimate mean WTP, as shown by the value of the proportionate variance. This feature of the results is highlighted in Table 8.13 where a wide range of values from a minimum of £562 203 to a maximum of £34 456 757 are established. Both these values were obtained from the logarithmic transformation. If this is excluded the range is narrower going from £1 939 054 to £19 269 093.

The difference in means test suggested by Thayer (1981) was applied to the four parametric measures of mean WTP and the Turnbull estimate. These are reported in Table 8.14 and show how the different estimators have produced significantly different estimates of mean WTP in most cases. The logarithmic transformation with its high variance is not significantly different from two of the other estimates. Otherwise, only the single variable model truncated at zero and Model (5) from Table 8.3 with other explanatory variables produce means that are not significantly different. This would suggest some difficulty in the results obtained.

Of the estimates of WTP, only the Turnbull estimator exhibits a value significantly different (at the 5% level) from the mean of the bid vector when a t-test of the difference between the mean of the bid vector and mean WTP is conducted.

Krström (1993) has suggested that this test checks for anchoring effects in the values of mean WTP. This would suggest, in turn, that only the Turnbull estimator has provided a value for mean WTP that reflects likely real payments and is not

Table 8.14: Matrix of Difference in Means Test Statistics^a for Mean WTPs

<i>Estimate of mean</i>	[1]	[2]	[3]	[4]
Hanemann (1989) [1]				
Truncation at zero [2]	2.942 ^b			
Log transformation of bid [3]	1.718	2.284 ^c		
Explanatory variables [4] with bid level	2.431 ^b	1.411	2.326 ^c	
Turnbull [5]	31.466 ^b	19.893 ^b	1.454	7.495 ^b

Notes: ^a Values given are t-statistics. ^b Significant at the 1% level. ^c Significant at the 5% level.

simply a function of the bidding process. It is also both a conservative figure and one of the more precise measures, making it arguably the appropriate measure of mean WTP from those available. The fact, evidenced by Table 8.13, that the value of parks is so hard to pin down from the estimates of mean WTP creates a feeling that this is a case of more is less.²¹ Despite this gloomy view it is possible to draw conclusions that can inform future policy. These are now examined.

8.8 Policy Considerations

One reason why it is possible to be sanguine about the number of measures of mean WTP, is that it is not strictly necessary to choose between them as in large part they

corroborate each other. This permits identification of a number of policy suggestions based on the results reported in Sections 8.3 to 8.7.

To begin with, the estimates of mean WTP per head summarized in Table 8.12 need to be related to the cost per head incurred by the Borough Council in Northampton in providing parks. As discussed earlier, these figures refer to individual WTP, making them comparable with the figure of £10.61 per head spent by the Council in 1996/7. It means that all the figures for mean WTP seem to indicate that the Council is obtaining good value from this spending. The only measure that suggests ambiguity about this conclusion is that where the logarithm of the bid was used to estimate mean WTP. The relative size of these cost and benefit figures would indicate, therefore, that the Council could have scope for increasing expenditure on parks to reflect the preferences of the town's population. For example, increased spending of £10 per head of population aged 18 or over would allow for variations in the values of mean WTP obtained.

The results in Section 8.4 also suggest policies for the Council on park provision. Most notably, parks, as an inferior good, might be used, where thought desirable, as part of a redistributive social policy. To the extent that the results in Tables 8.3 and 8.4 show that those on lower incomes seem to obtain greater benefits from this type of public provision, the Council could consider providing more parks or spending more on existing parks to redistribute welfare amongst the local population.

The non-monotonic nature of the relationship between the log of the odds and income may also create the possibility that those on higher incomes could make greater contributions to this type of good. This would not only mirror their greater ability to pay, but would as well, if the results reported here are accurate, reflect the extra benefits obtained from parks by higher income earners. Those in the upper Council Tax bands might, therefore, pay more Council Tax to reflect their greater benefit from parks.

The result that the timing of the survey affected the probability that respondents would accept bid levels put to them could also suggest that the Council study how spending on parks is spread throughout the year. A greater WTP for parks in the spring, which the results imply, indicates placing a greater emphasis on spending in this period. This might take the form of more spending on spring flowers or special events in the parks at that time of year. This proposition may need to be taken cautiously, as there might be other factors at work determining the effect of survey timing on willingness to respond positively, such as some form of interviewer effect. The effects on WTP of times of year not covered by this survey would also need to be investigated. This might conclude spending should be concentrated in times of the year other than the spring. Finally, the possibility that the effect of timing is an endogenous explanatory variable would need to be examined more closely.

The impact of household size probably reflects the fact that those in small households do not have access to gardens, but is also indicative of a probable increase in the value of parks in the future. This would follow from the predicted

increase in single-person households which, in turn will tend, other things being equal, to raise the value of the parks. On this account, the provision of parks would seem likely to remain an important part of the Council's function in the years to come.

Of the results in Section 8.3, the one of most interest is that showing that those who use parks are more prepared in principle to pay for their use. The implication would be that the Council could consider charging for the use of at least some parks to recoup the cost of provision. The level of exclusion costs would be relevant here, but this is clearly an area that warrants further exploration. Care would need to be taken, however, since the variable indicating usage of the parks was not significant in the logit analysis based on responses to the bid level. An area where charges might be levied, according to the results of Section 8.3, would be on those who use the parks for sporting activities. There is a suggestion, although not one supported by the logit analysis of Section 8.4, that those who use the parks for this reason are more prepared to pay in principle. It may be that charges for sporting activities could well be increased to reflect this phenomenon.

As with the tobit analysis, there was some evidence that the unemployed are less inclined to pay for the parks when the question about extra payment in principle was put to them, although again this result was not confirmed by the analysis of Section 8.4. The relatively low value placed by the unemployed of the town on the parks may represent a cause for concern for the Council, which they might wish to address by becoming more aware of the needs of this particular group.

The Council could also consider the issues raised by the negative effect that length of residence seems to have on being prepared to make an extra payment for the parks. For each extra year of residence, the probability that a resident will agree to more Council Tax is only 96.6% of that of the year before. This is not such a problem if there is a relatively dynamic population in the town with newcomers offsetting the effect of increasing residence amongst the existing population, but should average length of residence rise significantly over time it would raise questions about the Council's parks policy. Again, the qualification to this conclusion is that length of residence did not prove to be significant in the analysis of the bid level responses.

Taken together, the results of the logit analysis appear to offer a role for parks in diverse areas of policy. To that extent, the CV survey valuing Northampton's parks would not only seem to confirm the value of this particular type of public asset, at least in the town of Northampton, it also specifies matters, such as the redistributive role of parks, which might otherwise have been neglected. The use of the CVM, and the analysis of data produced by it, therefore, appear valid for this type of non-market good. This question of how appropriate the CVM is when applied to urban parks is addressed in more detail in the final chapter of this thesis.

Notes

1. I am grateful for comments received whilst preparing this chapter from Dennis Leech of Warwick University and Douglas Macmillan of Aberdeen University. I also benefited from the comments of participants of an Econometrics Workshop at Warwick University and the Public Sector Economics group at Leicester University, to both of which I presented earlier drafts of the chapter. None of these, I would emphasize, are responsible for any shortcomings that remain.
2. The explanatory variables used are described in Appendix 7.1 to Chapter 7.
3. In constructing the models, individual explanatory variables were first regressed on the dependent variable. These bivariate specifications gave a number of significant relationships, shown in Table 8.1A for variables significant at the 10% level or above. They indicate the range of variables used in constructing the models in Table 8.1.

Although some individual variables are significant in these specifications, they did not prove to be so in multivariate specifications. Also, none of the models in Table 8.1A scored highly on goodness-of-fit tests. Some variables significant at levels above 10% were retained for use in the multivariate specifications provided they were significant at the 20% level. This approach is recommended by Hosmer and Lemeshow (1989). The variable NOHHOLD in Model (3) in Table 8.1 is explained by this model-building strategy.

Table 8.1A: Individual Significant Relationships in Logit Analysis of Responses to Q9b and Q10e

Dependent variable: PAYMENT IN PRINCIPLE

Variable	Coefficient ^a	Chi-squared	Pseudo-R ² statistic	AIC	n	% predictions successful
INCOME	0.000033 ^c (2.444) ^c	6.2365	0.0228	1.351	199	62.3
GENDER	0.5505 ^c (1.951)	3.8499	0.0134	1.361	209	56.5
INTERVWR	0.8382 ^c (2.233)	5.1286	0.0179	1.357	209	59.8
UNEMP	-2.0552 ^b (-2.627)	9.7897	0.0341	1.335	209	60.3
PROFESSI- ONAL	0.8200 ^d (1.638)	2.9235	0.0102	1.368	209	56.0
APPRENT- ICESHIP	0.6937 ^d (1.767)	3.2930	0.0115	1.366	209	56.0
HWAYSD1	0.9051 ^b (3.072)	9.6400	0.0348	1.332	202	61.9
HWAYSD2	-1.0473 ^b (-3.327)	11.4223	0.0413	1.323	202	63.4
REFUSED1	0.6244 ^d (1.705)	2.9396	0.0103	1.367	209	58.4
SPORT	0.6840 ^d (1.783)	3.3484	0.0145	1.334	172	60.5
VIEW	0.7672 ^c (2.341)	5.6588	0.0245	1.321	172	60.5
USEDPARK	1.0380 ^b (2.746)	7.9135	0.0276	1.344	209	61.2
PEACE & QUIET	-1.4397 ^b (-2.970)	9.6839	0.0421	1.299	171	65.5
YOUNG	-1.1438 ^d (-1.850)	3.7443	0.0132	1.361	207	58.9
Q7D12 ^f	-11.476 ^d (-0.060)	3.3316	0.0117	1.364	208	57.2
Q7D13 ^g	-12.502 ^b (-0.063)	8.3767	0.0295	1.341	207	58.5
Q7D14 ^h	-11.499 ^b (-0.085)	6.7144	0.0236	1.348	208	58.2
NOQUAL	-1.2379 ^b (-3.643)	14.0789	0.0491	1.314	209	64.1

Notes: ^a Values for the coefficient on the variable in a bivariate logit specification with the dependent variable PAYMENT. A constant term was included in all specifications. ^b Significant at the 1% level. ^c Significant at the 5% level. ^d Significant at the 10% level. ^e t-statistics for individual coefficients are given in brackets. ^f A dummy variable where 1 = obtain satisfaction from others' use of the parks, 0 = otherwise. ^g A dummy variable where 1 = obtain satisfaction from knowing the environment is cleaner in Northampton when there are parks in the town, 0 = otherwise. ^h A dummy variable where 1 = obtain satisfaction from knowing those on lower incomes do not have to pay for the parks when they use them, 0 = otherwise.

4. This result is consistent with a correlation coefficient between this variable and WTP.
5. For examples, see both Bullock and Kay (1997) and Hanley et al (1998).
6. The derivation of this number of respondents is summarized in Table 6.9.
7. Table 8.2A gives the results obtained for variables which were not statistically significant when combined with the bid level as an explanatory variable, but which were tested for during the model-building process.

Table 8.2A: Non-significant Variables in Logit Analysis of the Bid Levels

Dependent Variable in all cases: RESPONSE TO BID

<i>Variable^a</i>	<i>Coefficient on variable</i>	<i>LR Test Statistic^b</i>	<i>Number of Observations</i>
AGE	0.013101 (1.063) ^c	1.1459 ^d	142
GENDER	-0.083468 (-0.214)	0.0458	142
INTERVWR	0.89523 (1.510)	2.3016	142
RESIDENCE	0.0034610 (0.324)	0.1054	142
NOPARKS	0.029437 (0.271)	0.0369	142
WALKING	0.52231 (0.923)	0.8579	126
PICNICKING	0.69562 (1.345)	1.8878	126
SPORT	0.36136 (0.744)	0.5638	126
CHILDREN	-0.01851 (-0.043)	0.0054	126
VIEW	0.25441 (0.598)	0.3643	126
FLOWERS AND PLANTS	0.06798 (0.150)	0.2938	125
OPEN SPACE	0.19674 (0.437)	0.4628	125
PLAY AREA	0.05348 (0.107)	0.2826	125
PEACE&QUIET	-0.10224 (-0.155)	0.2949	125
FACILITIES	-10.669 (-0.060)	2.1238	125

Notes: ^a In each case the variable concerned was combined with a constant term and the bid level in the logit regression. ^b Where it was nested in the unrestricted model that included the variable, the log-likelihood statistic from the model in Table 8.2 was used to calculate the test statistic. In other cases a separate regression using the reduced number of observations gave the value of the restricted log-likelihood function. ^c t-statistics are given in brackets. ^d Critical value at 10% level of significance with one degree of freedom =2.7055.

8. Membership of an environmental organization was individually significant, albeit at the 10% level, when combined with the bid level as an explanatory variable, as was the variable EVENTS. The result of including each as explanatory variables is shown in Table 8.3A.

A likelihood ratio test that compared Model (1) in Table 8.3A with that in Table 8.2 gave a statistic for the variable ENVIRONMENTALIST equal to 2.9381. For the variable EVENTS, a likelihood ratio statistic of 2.89878 was calculated using a restricted version of Model (2) in Table 8.3A. In neither case was it possible to incorporate the variable in any other specification.

Table 8.3A: Membership of an Environmental Organization and Events as Explanatory Variables

Dependent variable: RESPONSE TO BID

	<i>Model (1)</i>	<i>Model (2)</i>
<i>Variable</i>	<i>Coefficient</i>	<i>Coefficient</i>
Constant	2.2091 ^a (5.029) ^c	3.0665 ^a (4.366)
BID	-0.042347 ^a (-5.348)	-0.042597 ^a (-4.957)
ENVIRONMENTALIST	1.2628 ^b (1.643)	
EVENTS		-0.94060 ^b (-1.646)
Number of observations	142	126
Log likelihood function	-77.5823	-68.1481
Restricted log likelihood	-98.4128	-87.3365
Likelihood ratio statistic	41.6611	38.3768
Pseudo-R ²	0.2117	0.2197
AIC	1.1209	1.0976
Percentage of successful predictions from the estimated model	71.8	70.6

Notes: ^aSignificant at the 1% level. ^bSignificant at the 10% level. ^ct-statistics are given in brackets.

9. For three groups of variables, a likelihood ratio test was conducted using the specification in Table 8.2 as the form of the restricted log-likelihood, to test whether or not the variables taken together were significant. These were location, occupation and educational qualifications.

For the location dummies, the value of the log-likelihood when they were all included with the bid level as explanatory variables was -77.9756 . The resulting test statistic was 2.15142, well below the critical value for the chi-squared statistic with four degrees of freedom at the 5% significance level (9.4877).

For occupational categories, the log-likelihood was -75.4827, the test statistic 7.1373 and the critical value with eleven degrees of freedom at the 5% significance level 19.6751. Again, the hypothesis that all the coefficients on the occupational dummy variables equal zero cannot be rejected.

Finally, educational qualifications were jointly significant at the 10% level. The test statistic had a value of 13.5808, against a critical value with seven degrees of freedom at the 10% level of significance of 12.0170. When a similar test of joint significance was performed after including educational qualifications in Model (5) of Table 8.3 and using the log-likelihood function of this model as the restricted log-likelihood function, there was no evidence of significance. The value of the test statistic was 2.6092.

10. The variables other than the bid level in Model (5) were also jointly significant when a regression of bid value on RESPONSE was run using the 90 respondents in Model (5). The result of this regression is given in Table 8.4A.

Table 8.4A: Bid Level as Explanatory Variable for Respondents in Model (5) of Table 8.3

Dependent variable: RESPONSE TO BID

<i>Variable</i>	<i>Coefficient</i>
Constant	2.3400 ^a (4.236) ^b
BID	-0.036558 ^a (-4.101)
Number of observations	90
Log likelihood function	-51.13510
Restricted log likelihood	-61.58086
Chi-squared	20.89152 ^a
Pseudo-R ²	0.16973
AIC	1.15856
Percentage of successful predictions from the estimated model	73.3

Notes: ^aSignificant at the 1% level. ^bt-statistics are given in brackets.

Using the log-likelihood function in Table 8.4A in a likelihood ratio test of the joint significance of the variables in Model (5) (income, income squared, number in the household and DATED4) gives a test statistic with a value of 23.2106. The critical value at the 1% level of significance with 4 degrees of freedom is 13.2767. The model in Table 8.4A also has the expected signs on the constant and bid terms.

11. This result follows from setting the partial derivative of the log of the odds ratio with respect to income in the logit function of Model (5) equal to zero and then solving for income.

12. Similar tests for a quadratic relationship were tried for the variables for age and length of residence in Northampton. In neither case were the coefficients on the variable or its square statistically significant.
13. The t-statistic is calculated as:

$$t = \frac{c + 2d(\text{INCOME})}{\text{SE}[c + 2d(\text{INCOME})]}$$

where SE(.) is the standard error of the slope of the function and equals:

$$\sqrt{\{\text{var}(c) + [\text{var}(d) (2 * \text{INCOME})^2] + [4 * \text{INCOME} * \text{cov}(c, d)]\}}.$$

14. This result is demonstrated as follows.

If the probability that a respondent will respond positively to a bid value when interviewed in April is $\Pi(1)$, the probability that the respondent will respond negatively when interviewed in April is $1 - \Pi(1)$. The odds of the outcome for those interviewed in April is then defined as:

$$\Pi(1)/[1 - \Pi(1)].$$

If the probability of a positive response to the bid question for respondents not interviewed in April is $\Pi(0)$, the odds for these can be given by:

$$\Pi(0)/[1 - \Pi(0)]$$

The odds ratio is the ratio of these two odds, namely:

$$\frac{\Pi(1)/[1 - \Pi(1)]}{\Pi(0)/[1 - \Pi(0)]} = \psi$$

This ratio incorporates the two variables in the regression, in this case, response to the bid value and being interviewed in April. As such, it is a measure of how much more likely it is that those interviewed in April will give a positive response to a bid value than those interviewed in other months. The natural logarithm of ψ is the log-odds ratio.

The various probabilities comprising the odds ratio can, for the variables concerned, be defined from the logistic function as:

$$\begin{aligned} \Pi(1) &= \frac{\exp(a_0 + b_0 \text{DATED4})}{1 + \exp(a_0 + b_0 \text{DATED4})}; & 1 - \Pi(1) &= \frac{1}{1 + \exp(a_0 + b_0 \text{DATED4})} \\ \Pi(0) &= \frac{\exp(a_0)}{1 + \exp(a_0)}; & 1 - \Pi(0) &= \frac{1}{1 + \exp(a_0)} \end{aligned}$$

where, a_0 is the constant term in the logit regression *plus* the mean value of other variables in Model (5) multiplied by their coefficient values; and b_0 is the coefficient on DATED4 in Model (5).

These identities for the probabilities can be substituted into the expression for the odds ratio to yield the result:

$$\psi = \exp(b_0) \Rightarrow \ln(\psi) = b_0$$

Where there is more than one dummy variable, the coefficients on the variables can still be interpreted as log-odds ratios. Now, however, as Hosmer and Lemeshow (1989) show, the log-odds ratio is that between each variable and the reference or default group for the dummy variables used in the regression. Thus, in Model (6) of Table 8.3, where there are two dummy variables for the timing of the survey, DATED3 and DATED4, the two log-odds ratios are those between the reference group, all months in which the survey was conducted other than March and April, and each of the two months in the regression.

15. Applying the formula of Cameron (1988) for mean WTP to this estimation of the logit model gives a mean WTP of £54.70. Weighting this by the proportion of respondents not prepared to pay gives a value for mean WTP of £37.17.
16. The relevant expression for $f(x)$ in equation (8.1) is now:

$$f(x) = \frac{-b \exp-(a + b \ln(x))}{x[1 + \exp-(a + b \ln(x))]^2}$$

It was the expression used to calculate mean WTP in this case.

17. As reported in Buckland et al (1996), the relevant expression for the variance of m_1 when the log of the bid transformation is used is:

$$\begin{aligned} \text{var}(m_1) = & \text{var}(b) \left[\int_0^{\infty} \frac{u \{ \{ b \log(x) - 1 \} - \{ b \log(x) + 1 \} u \}}{(1 + u)^3} dx \right]^2 + \text{var}(m) \left[\int_0^{\infty} \frac{b^2 u(u-1)}{(1 + u)^3} dx \right]^2 \\ & + 2\text{cov}(b, m) \left[\int_0^{\infty} \frac{u \{ \{ b \log(x) - 1 \} - \{ b \log(x) + 1 \} u \}}{(1 + u)^3} dx \right] \left[\int_0^{\infty} \frac{b^2 u(u-1)}{(1 + u)^3} dx \right] \end{aligned}$$

where u now equals $\exp[-b\{\log(x) - m\}]$. Once again, where necessary, estimation of the values is carried out by numerical integration.

18. When mean WTP is calculated without an upper truncation point, the estimated value of m_1 is £74.04, m_0 is £50.30 and the lower and upper limits of the 95% confidence interval for m_0 are £10.97 and £230.56 respectively. The difference in these results from those reported in the text emphasizes the sensitivity of estimated mean WTP to the choice of an upper truncation point when the natural logarithm of the bid is used in the logit regression.
19. The results from a regression incorporating the bid term are used as follows. First, the form of the logistic regression becomes:

$$\Pi = 1/[1 + \exp(-\beta(x - \delta/x - \mu))], \quad (8.4)$$

where δ is an unknown parameter to be estimated.

It is possible to reformulate the expression $\exp(-\beta(x - \delta/x - \mu))$ in equation (8.4) as:

$$\exp(-a - bx - e/x),$$

where, $a = -\beta\mu$ in equation (8.4) and is estimated by the coefficient on the constant in Table 8.9;
 $b = \beta$ in equation (8.4) and is estimated by the coefficient on the bid term (x) in Table 8.9;

and $e = -\beta\delta$ in equation (8.4) and is estimated by the coefficient on the reciprocal of the bid term in Table 8.9.

For Table 8.9, $\delta = -e/b = -(-21.472/-0.049182) = 3242.4871$.

These values can be substituted into equation (8.1) for estimating mean WTP using the expression for $f(x)$:

$$f(x) = \frac{-b (1 + \delta/x^2) \exp-(a + bx - b\delta/x)}{[1 + \exp-(a + bx - b\delta/x)]^2}$$

In addition to the variance of b , the variance of m and the covariance of b and m , the following expressions are needed to estimate the variance of this measure of mean WTP:

$$\text{var}(\delta) \approx \frac{e^2 \text{var}(b) + b^2 \text{var}(e) - 2be \text{cov}(b,e)}{b^4}$$

$$\text{cov}(b,\delta) \approx \frac{e \text{var}(b)}{b^2} - \frac{\text{cov}(b,e)}{b}$$

$$\text{cov}(m,\delta) \approx \frac{a e \text{var}(b) - b e \text{cov}(b,a) - ab \text{cov}(b,e) + b^2 \text{cov}(a,e)}{b^4}$$

20. Each covariance term is of the form:

$$2 * \text{MeanA} * \text{MeanB} * \text{cov}(\text{coefficients of variables A and B}),$$

where A and B are two of the explanatory variables.

The five explanatory variables of Model (5) means there are ten such terms in this expression.

21. The estimates of mean WTP provided do not exhaust the possibilities.

Methods for estimating mean WTP from a CV dichotomous choice format continue to proliferate, as Kriström (1997) and Langford et al (1998) demonstrate.

CHAPTER NINE

VALUING NORTHAMPTON'S PARKS: THE LESSONS LEARNED

9.1 Reasons for Optimism

The last four chapters have concentrated on the results obtained from two surveys conducted in Northampton to establish a value for the parks in the town. In reporting these results there has been an implicit assumption that respondents have stated their true preferences for parks in response to the questions which they were posed.

Authors like Diamond and Hausman (1993) have suggested, however, that respondents in CV surveys do not necessarily base their answers to the questions posed on a careful examination of underlying preferences. There has also been speculation that even where WTP is correctly elicited from respondents it may still be an inaccurate reflection of their preferences. Tversky et al (1990), for example, have shown experimentally that 'preference reversal' can occur where individuals choose options that do not reflect their stated WTP. Irwin et al (1993) make a similar point in an environmental setting in showing how individuals may express a higher WTP for marketed consumer goods but still select a proffered option involving an environmental improvement.

Others, arguing from a standpoint of social and political theory, have criticized the very idea that the values attached to the environment can be obtained from expressions of WTP. O'Neill (1997) proposes that the incommensurability (his

word) of different values in a pluralist society do not permit their placement on a monetary scale and suggests that choices about the environment should instead be made by 'practical judgement'. As evaluation techniques are associated with those in positions of social and economic dominance, any suggestion that they represent some form of objective measuring rod for establishing the value of the environment is, in his view, not credible. Vatn and Bromley (1994) were similarly sceptical that 'enlightened' decisions about environmental choices could only be made when monetary valuations were used or that all the values attached to an environmental good could be picked up by a hypothetical valuation procedure.

Concerns like these and others expressed in Chapter 4 about what can be ascertained from a CV survey inevitably cast a shadow over the results reported upon in this thesis and are a warning not to draw excessively firm conclusions from those results. There are, nevertheless, lessons to be learned from the exercise that has been conducted, which are not undermined by arguments about either the technical or philosophical bases of the CVM. There are two reasons for taking this optimistic position.

The first is that the raw data have been subjected to a degree of analysis that has fully tested the various conclusions. As an illustration, when establishing mean WTP a variety of methods were used to give a number of measures, nearly all of which supported the central notion that the population of Northampton placed a value on the parks of the town somewhat greater than the cost of maintaining them. Where this result was not confirmed, it could be shown that problems were related to the

underlying econometric specification. As far as possible, therefore, conclusions were arrived at by careful consideration of alternative possible explanations. This draws the warning, however, that the same data were, of course, being used irrespective of the techniques being employed and that any conclusions are, consequently, only internally consistent.¹

For this reason, the other cause for optimism, suggested by Spash (1997b), is significant as it does not depend upon appeals to empirical rigour. Instead, his contention that human control of environmental systems and application of economic ideas to their management is more readily acceptable, in what he calls the urban-industrial environment than in the management of wilderness areas, seems a particularly relevant point when considering urban parks.² They represent, with the possible exception of gardens, the apotheosis of the idea that human beings are as much creators of the natural environment as they are stewards of it. This point is borne out in Chapter 6 of this thesis where evidence was presented in Tables 6.5 and 6.7 which supported the idea that parks are perceived, at least by residents of Northampton, as an environmental asset. If this is so, not only will people take control of the environment provided by parks much more directly than would be the case with, say, an unspoiled tract of land, it is likely that there will be far greater acceptance of the idea that parks, even though an environmental asset, are also an economic good that must be assessed in value against other economic goods. The upshot is that the CVM will provide an acceptable measure of possible values for such a good.

The lessons learned in the thesis, which are the subject of the remainder of this chapter, are, accordingly, of some relevance in making judgements under a variety of headings about the parks provided in Northampton and the use of the CVM in assessing their value. The four main headings under which these lessons fall are:

- policy conclusions that can be drawn;
- issues to do with applying the CVM to a different class of non-market goods;
- specific recommendations that follow for the town of Northampton;
- the ideas for future research highlighted by the work done in preparing this thesis.

Each of these is addressed in turn in the next four sections.

9.2 Policy Conclusions

The policy suggestions that have arisen from the CV survey are perhaps crucial for, if the CVM has any justification as a technique, it is as a means to develop policy. Even critics of the technique acknowledge this point, although their concern is that, if policy is developed using the results from CV surveys, incorrect choices will be

made. Much of the recent research agenda in the CVM, in fact, has been driven by the demands of policy makers wishing to find out if CV values replicate real market values. Given this, a key outcome of this CV survey is that a number of policy points have, indeed, been raised.

Although they have been presented elsewhere in the thesis, in this section the policy ideas suggested in previous chapters are drawn together in Table 9.1 where they are categorized to reflect three levels of confidence about their appropriateness. The list is a useful reminder of how knowledge from a CV survey can produce valuable practical outcomes.

Two points emerge from the high priority recommendations in the table. First, there would seem to be some demand for extra spending on parks in Northampton. Indeed, if anything, the results on valuation of the parks represent an understatement. As Loomis (1996) has suggested, it is possible that the demand for a non-market good can be spread over a large geographical area and failure to incorporate wider populations can result in serious underestimation of the value of non-market goods. As this CV survey was restricted to residents of the town, the total valuation reported for the Northampton's parks may actually be below their true value. The possibility of non-use values occurring outside the town's borders can also not be discounted, given the evidence of such values in this study.

Increased emphasis on park provision, the results show, would have some potentially beneficial effects for the lower-income residents of the town. This means

Table 9.1: Policy Prescriptions for the Parks of Northampton

<i>Prescription</i>	<i>Section References</i>
<i>I. HIGH PRIORITY^a</i>	
• Council to consider increasing expenditure on parks to reflect fully the preferences of the town's population	7.3, 8.6
• Increased spending on parks to come, at least in part, from a reduction in spending on highways	5.3, 6.3
• Parks to be used, where thought desirable, as part of a redistributive social policy	5.4, 5.7 8.4, 8.8
• Those on higher incomes to be expected to make greater contributions to the maintenance of parks	8.4, 8.8
<i>II. MEDIUM PRIORITY^b</i>	
• Council to consider the use of charging for entrance in parks where exclusion costs permit	5.7, 8.3 8.8
• Council to consider a possible increase in charges for sporting activities	8.3
• Council to contemplate making parks more attractive to the unemployed	7.3, 8.3
• Council to ensure more is done to assist those in employment by ensuring a range of activities at times convenient for those in work	7.3, 8.3
• Provision of two types of park to reflect the two main types of user, the "open-spacers" and "facility-attracted"	5.3, 5.7, 6.4
<i>III. LOW PRIORITY^c</i>	
• Council to rearrange spending on parks through the year to reflect the population's preferences	7.3, 7.4 8.4, 8.8
• Council to assess the issues that are raised by the negative effect that length of residence might have on attitudes towards parks	5.4, 8.3
• Enhanced provision of special events in the parks	5.4, 7.2
• Further research to investigate the impact of age on WTP for parks	6.10, 7.2 7.3, 7.4

Note: ^a Recommendations made with some degree of confidence which would generate considerable net benefits if implemented. ^b These are based on ambiguous results, even though there is a good prospect that benefits would follow from the policy. ^c Primarily based on doubtful statistical results, the benefit of which would need to be established by further research.

that parks, being an inferior good, at least at some levels of income, can play an important role in social policy, something that would not be immediately apparent from a cursory consideration of their function. The implications of this result go beyond the specific case of Northampton and would seem to be a major (if not the major) finding of the research embodied in this thesis.

Although it would be inappropriate to emphasize the other policies to the same degree, they are all worthy of attention. If nothing else, they form the basis, as discussed below, for some ideas on future research possibilities. They also indicate, as Breffle et al (1998) discovered in their study of the role of the CVM in valuing undeveloped urban land, that the CVM is a flexible policy tool that can provide a range of sound policy guidance.

9.3 Applying the CVM to an Excludable Public Good

Applying the CVM to a good, which, as discussed in Chapter 2, is essentially an excludable public good, was a further feature of this thesis. In fact, the pleasant surprise was that many of the problems that can occur in applying the CVM to environmental resources more closely matching the ideal of a pure public good are not found with a good like urban parks. For example, familiarity with the good is often an issue when applying the CVM. This can lead, as Bjornstad and Kahn (1996a) indicate, to situations where CVM researchers often have to ask respondents to form preferences using information provided to them by researchers. This could

not be said to have happened with the survey into parks where respondents generally showed familiarity with the good, as seen in the results of Table 6.3. These indicated that over 80% of respondents had visited a park at least once during the twelve months prior to the survey and that they would, accordingly, have some knowledge of what they were being asked to value.

It was also evident that respondents generally accepted the valuation process as valid for a good of this type. The fact that it was possible to develop relatively robust econometric models from the data collected is one sign of this, as is the relatively low level of item non-responses obtained to the bid questions. Item non-response can be a problem in CV surveys, but, as Table 6.1A showed, only 6 respondents (2.9% of the total sample) in the main survey gave answers suggesting that they thought the valuation process to be invalid.³ The CVM appears to have generated meaningful results for parks in Northampton.

This, of course, is not to say that all issues have been resolved. In particular, the question of determining whether it would be preferable or not to provide parks as a market rather than a non-market good remains open. When it became apparent in the pilot survey, as described in Chapter 5, that respondents were not reacting well to the idea that an entrance fee might be charged for parks, it was necessary to abandon the use of fees as the payment vehicle and to concentrate instead on the Council Tax. This decision, despite being required for the conduct of the survey, did mean that a judgement was being made about the nature of provision of the good. Implicitly, it was assumed that parks were to be provided through non-market mechanisms. As

was seen in the discussion in Chapter 2, however, there should, certainly in connection with a good like parks, be no such prior assessment of this question. It may be, therefore, that more attention would need to be given to the possibility of constructing a CV survey that adequately explores the nature of parks as a good as much as it establishes their monetary value.

If the policy implications of the survey are a potential success of this thesis, not addressing properly the question of the nature of parks as a good is a failing. It would have been of some value to identify in more detail how this question could be settled. Despite this, the fact that the method has been applied at all to a good where there is some ambiguity about its character represents a step forward, particularly since the application has succeeded on at least some fronts.

9.4 Recommendations for Northampton

The thesis was primarily concerned with an application of the CVM to a particular type of environmental asset, but also had the aim of identifying results of value to the town of Northampton. That this has been achieved is apparent from the policy recommendations in Table 9.1, the vast majority of which can be linked to the situation in the town. There could be implications for other towns, but as Breffle et al (1998) have suggested, when it comes to the application of the CVM to land use issues, policy recommendations will tend to be specific to the context in which they

are generated. The list of policies, although of possible interest to other towns, remains, therefore, primarily a blueprint for action in a particular place.

In addition to policies on parks, the CV survey results appear to demonstrate that in Northampton the provision of local public goods broadly corresponds to the preferences of local residents. The attitudes reported in Table 6.1 showed a generally high degree of satisfaction with local Council spending compatible with the theoretical ideas of Tiebout (1956). The one area of spending where there was some evidence of dissatisfaction with Council policies, highways, still had a majority indicating broad support. The results on attitudes were also consistent across the pilot and main surveys, which would encourage the feeling that they were representative of the local population's views.

The suggestion from the survey that in its parks the town of Northampton has a valuable asset producing considerable welfare benefits for residents is a useful lesson in a situation where parks as open space may represent potential development opportunities for industrial or housing purposes. The monetary valuations of parks could provide the basis for compensation for loss of benefits amongst the residents of the town in the event of development taking place. If this did occur, it would be quite consistent with what has happened in the United States where, despite the reservations of those like Cummings and Harrison (1994), the CVM is now accepted by the courts as a reliable means for assessing compensation when there is damage done to a natural resource. The potential for compensation would also afford a further degree of protection to the integrity of the parks as open spaces.

The final point of specific relevance to Northampton is that the CVM could become part of the consultations regularly conducted by the Council into perceptions of its services amongst residents. Altaf and Hughes (1994) may have argued that the CVM is useful as a tool of economic democracy in the developing world, but there should be no reason why a similar use of the technique could not be made in Northampton as part of a regular assessment of the value of the parks. As Danielson et al (1995) have pointed out, local policy makers need to be able to assess the extent of constituency support for local environmental programmes. In the case of Northampton, using the CVM could ensure the building of a database over time to track changing perceptions of the town's attitudes towards its parks. Policy could then be adjusted to reflect nuances in attitudes uncovered by the series of CV surveys. This would go some way to taking account of the demands of different user groups which may at present, as Welch (1995) has stated, be overlooked in the deliberations of those who manage the parks.

9.5 Thoughts on Future Research

The CVM and the analysis of the data produced by it seems to have been vindicated in this application to urban public parks. Questions do, of course, remain unanswered and they represent an agenda for further work. In this final section of the thesis, some comments about research suggestions are made that arise out of the experience gained in conducting this particular CV survey.

First, it would be helpful if the CVM were applied to the valuation of parks in other towns to confirm, or otherwise, the results reported on the factors that explain WTP for this type of local public good. These applications could be preceded by benefits transfer analysis of the data to establish initial ideas on valuations of parks in other towns. Alberini et al (1997) gives examples of how econometric results from one study can be applied to other contexts and this would be relevant here. If results can be replicated in other local authority jurisdictions both in the United Kingdom and elsewhere, it would add substance to what are presently policy ideas based on just one study. This study has, moreover, been conducted in a town where public parks play a significant role in local public good provision. To examine their value in a town or towns where this was not the case would be a useful complement to the current results.

The robustness of the results obtained from the CV survey in this thesis could also be tested for using the hedonic price method to value the parks of Northampton. The alternative valuation that would be obtained, although one that would ignore at least some non-use values, would help to establish the construct validity of the CV survey if similar results were obtained. There can be problems collecting data for such studies, but, if these problems were overcome, any results would be a helpful addition to the debate.

Further CV studies in other towns might also shed light on relationships between WTP and certain explanatory variables, about which there was ambiguity in this study. One specific case that would need to be addressed would be the importance of

age as a determinant of WTP. The differences in the sign of this variable in different econometric specifications was perplexing for a variable that might well be thought to have a role to play in determining WTP. Clarification on this issue would, therefore, be beneficial. A similar point could be made about the relationship between WTP and length of residence in the town, a question not fully resolved in this study, as was not the problem of interviewer bias.

In conducting the new studies, it would be advisable if they took account of technical points overlooked in this study. Any future exercise might be preceded by use of focus groups in drafting the survey instrument. In valuing parks, the groups could examine more carefully the circumstances in which respondents might react favourably to the idea that parks could be excludable goods for which an entrance fee might be charged. Application of the technique in towns where charging for parks is already an established feature would be useful, since residents of these towns would, presumably, more readily accept such a scenario as viable.

Future studies would also benefit from considering the information that might need to be provided to respondents to ensure that they are properly aware of how parks are provided and the nature of those parks. Although these were not real issues in the case of Northampton's parks, this may have been a function of the particular study in that with a large number of parks in the town, its residents may have been more conscious of the nature of this type of good than the residents of other towns where awareness of parks might be lower.

A further feature of the elicitation procedure that could represent a fruitful source of research activity would be to examine how far respondents could be cajoled into giving positive answers to bid questions. Lunander (1998) has suggested that incentives can be used to cause respondents to overstate WTP, so this is a potentially sensitive issue. In this survey a number of efforts were made through use of follow-up questions (Q9e and Q10h) to obtain positive responses. This was done to ensure respondents were not simply registering protest 'votes' against the Borough Council, possibly for reasons unrelated to their valuation of the parks. A potential effect of this strategem, and the one which would merit possible consideration in future exercises, is that respondents may have felt pressurized into giving a positive answer. Given the evidence on 'yea-saying' in CV surveys, anything that causes overstated values would be unwelcome. Further experimentation, along lines similar to Lunander (1998), with varying degrees of persuasion in the elicitation procedure might, therefore, usefully address this question.

It would be an additional useful exercise to value individual parks in Northampton using the CVM. The values reported in this CV survey relate to the parks in the whole town, but the frequency of use reported in Table 6.4 and the ideas on which parks should be sold suggest certain parks might be valued more than others. This would also help to address the issue of scope identified by Arrow et al (1993) as an important element in establishing the validity of a CV survey.⁴ Using approaches suggested by Harrison and Lesley (1996) to reduce the cost of such exercises would also, in this local setting, be feasible, so this need not be a prohibitively expensive idea. A more systematic valuation of single parks might also contribute to revealing

any embedding effects associated with valuing the parks of Northampton. If the town's residents are merely purchasing moral satisfaction as suggested by Kahneman and Knetsch (1992), there could be a problem with the results. Assessing the value of individual parks could provide evidence on this question if component sensitivity tests⁵ of the type proposed by Carson and Mitchell (1995) were applied to the results.

Whilst none of the above prescriptions represent research into the relationship between stated and revealed values, which Bjornstad and Kahn (1996b) have advocated as the way forward for the CVM, none of them is inconsistent with calls for such a research agenda. Indeed, the policy recommendation to establish possible charging experiments for Northampton's parks indicates that such research could be feasible in this setting. This policy would not only reflect a change in the perception of how parks should be provided, but would also create a framework for comparing real and hypothetical payments in the context of park provision. Research developments in this area need not, therefore, necessarily be outside the mainstream of CV research.

The fact that the other suggestions in this section are restricted to possibly narrow improvements in the way that a particular type of environmental asset is valued should not be taken as a point for censure. Instead, it is symbolic of the degree to which it has been possible to apply the CVM in a setting where, the efforts of Combs et al (1993) excepted, applications have previously been limited. The potential for improving the conduct of such applications suggests not that there has

been a paucity of outcomes from the current exercise, but rather that there is a future for the CVM in identifying the benefits derived from an asset found in most towns of any size. Improving the ways in which these applications are executed would be a tribute to the flexibility of a technique that, despite its problems, remains the best hope for establishing the values of environmental assets.

Notes

1. The study can also be assessed against the three criteria proposed by Mitchell and Carson (1989) for assessing the validity of a CV study, namely content, criterion and construct validity. Content validity requires that the CV study be conducted along appropriate lines. The study reported upon in this thesis complied with this criterion in that, with the exception of sample size, the process adopted the NOAA guidelines. Criterion validity compares the stated CV values obtained against real payments made by respondents. It was not possible to test for this effect since no real payments for entry are made for parks in Northampton. Finally, construct validity requires both that similar results are obtained when other valuation methodologies are used and that the results obtained are consistent with theoretical expectations. The former was not tested for in this particular study, but the results obtained from the econometric analysis were consistent with *a priori* theoretical expectations.

2. Spash (1997b) conducts his discussion in terms of the problems of managing Sites of Special Scientific Interest (SSSIs), which he puts forward as an example of an environmental asset where economic considerations will predominate because of the influence of human control. The difficulties which Spash (1997b) suggests environmental agencies have in allocating budgets amongst a range of SSSIs have parallels with the issues faced by a local Council allocating expenditure to urban parks.
3. The equivalent figure in the pilot survey was 5 respondents or 8.6% of the sample. All these respondents, however, had been presented with the entrance fee payment vehicle.
4. Smith and Osborne (1996) have proposed a scope test based upon meta-analysis that could be helpful in this context.
5. These tests examine whether respondents would change their valuation of a good in response to different levels of the good being put forward for consideration. In the case of Northampton's parks, difference in levels would be that between one park being valued and all the parks in the town being valued.

APPENDIXES

Appendix ONE

Pilot Survey Questionnaire (Council Tax as Payment Vehicle)

Questionnaire to evaluate the benefits associated with parks in Northampton (C)

Introduction

Hello! My name is Thomas Coskeran and I am a lecturer at Nene College here in Northampton. As part of my work at the College, I am carrying out some academic research, which will also form part of a PhD I am studying for at Warwick University.

The research involves me in talking to a number of people in the town to find out how they use the public services provided by Northampton Borough Council and how much these are worth to them. I would be grateful, therefore, if you would participate in a survey on this issue.

Before beginning to ask the questions, I would like to emphasize that in this exercise there are no right or wrong answers. It is what you think about the issues involved that is important.

Attitudes to Services

I would like to begin by asking you to consider this list of services provided by the Borough Council in Northampton. *(Show respondent CARD 1.)*

Q1 From what you know about these services in the town, could you say if you feel the amount being spent on them by the Council is a) Too much; b) About right; or c) Too little?

	Too much	About right	Too little	Don't know	Refused
--	-------------	----------------	---------------	---------------	---------

Highways

Parks

Refuse
Collection

Housing

Recreation
& Tourism

(If respondent answers "too much" on park, go to Q2a. If respondent answers "too little" on park, go to Q3a. Otherwise, go to Q4.)

Q2a You said that the Council is spending "too much" money on parks. I would like to ask you more about this topic. In your opinion, do you think that the Council should be spending a great deal less or only a little less on parks?

A great deal less A little less Don't know Refused

Q2b If the Council were to reduce the amount spent on parks, how would you like the money saved to be used?

- a) More spending on one or more of the services listed (please specify) *(Show respondent CARD 1 again.)*
- b) A reduction in Council Tax
- c) Other (please specify).....

(If an alternative service is suggested, remind respondents that the Borough Council is limited by statute in the sort of services it can deliver. Then go to Q4.)

Q3a You said that the Council is spending "too little" on parks. I would like to ask you more about this topic. In your opinion, do you think that the Council should be spending a great deal more or a little more on parks:

A great deal more A little more Don't know Refused

Q3b If the Council were to increase the amount spent on parks how would you like the money for this extra spending to be raised?

- a) By cutting spending on one or more of the services listed (please specify)
..... *(Show the respondent CARD 1 again.)*
- b) By raising Council Tax
- c) Other (please specify).....

Household Activities

I would now like to consider in more detail the way in which you use one of the services provided by the Borough Council. In particular, I would like to look at your use of the parks provided in the town by the Council.

Q4a Have you or any of the members of your household used any of the parks in Northampton for any activity during the last twelve months?

(If the respondent seems unsure about this question, mention that this could include activities such as walking, picnicking, sport, using children's facilities, attending a special event such as the Balloon Fair, enjoying the view, etc.)

YES/NO/Don't know

(If respondent answers YES, go to Q4b. If respondent answers NO, go to Q7.)

Q4b Please name the park or parks that you have used.

- Name of park(s).....
- Forgotten
- Don't know

Q5 Please say for which of the following activities you used the park. *(Show respondent CARD 2.)*

	YES	NO	Don't know
Walking		
Picnicking		
Organized Sporting Activity			
Outing with children		
Enjoying the View		
Special event e.g. Balloon fair		
Other (please specify)			

Q6 When you visit a park in Northampton, which feature of the park would you say contributes most to your personal enjoyment? *(Show respondent CARD 3.)*

- Presence of flowers and plants
- Open Space
- Children's Play Area
- Peace and Quiet
- Facilities available (e.g.restaurant)
- Other (please specify).....

Q7 Here are a number of reasons why people feel parks should be provided by the Council. Please read them through on the card. *(Show respondent CARD 4 and ask them to read through it.)*

Please indicate up to TWO reasons, if any, from the list which are important to you personally..... *(Use numbers from the list. For 1, indicate the answer in brackets.)*

Hypothetical Scenario

I would now like you to imagine that the Council is considering a reduction in the amount it spends on parks. It has two options that it can adopt. It can either reduce spending on the maintenance of parks or it can sell off one of the parks in the town.

Q8 Which of these two possibilities would be more acceptable to you? Would you prefer to:

- a) Reduce spending on the maintenance of parks and the facilities provided
- or b) Sell off one of the parks?
- NeitherDon't know Refused

(If respondents indicate that choosing the selling option would depend upon what the land was used for after the sale, indicate that this should not be relevant to their decision. We are only interested to see if they would consider giving up one of the parks, albeit under certain conditions. If the respondent chooses the option to reduce spending, go to Q9a. If respondent chooses the option to sell, go to Q10a. If any other option is chosen, go to Q15.)

Reduce spending on maintenance

Q9a You have chosen the option to reduce spending on maintenance and facilities in parks. Which ONE of the following ways of reducing spending would you choose?
(Show respondents CARD 5.)

- 1. Less maintenance of flowers and plants in parks
- 2. A reduction in the maintenance of children's play areas
- 3. Closing toilet/nursing facilities
- 4. Reducing the number of "free" events in the parks
- 5. Other (please specify).....

Q9b Now imagine that the decision to cut spending on parks could be avoided by an increase in Council Tax. Would you be willing to increase your annual Council Tax payments to avoid the cut in spending on park maintenance? YES/NO

(For non-residents, explain that the Council Tax could be raised through a Parish Precept payable to the Borough. If the respondent replies "NO", go to Q9e. Otherwise go to Q9c. Respondents can also be shown the current Council Tax bands to give them an idea of current payment levels.)

- Q9c Would you be prepared to pay £10 extra Council Tax per year? YES/NO
Would you be prepared to pay £25 extra Council Tax per year? YES/NO
Would you be prepared to pay £50 extra Council Tax per year? YES/NO
Would you be prepared to pay £100 extra Council Tax per year? YES/NO

(Circle the amount put to the respondent. If YES, go to Q11. If NO, go to Q9d.)

Q9d How much extra Council Tax per year would you be prepared to pay to maintain the current level of spending on the maintenance of parks? £.....

(Then go to Q11.)

Q9e People have different reasons for saying that they would not be prepared to pay anything. For some it is because they would actually like to see a reduction in spending on parks. For others, it is for different reasons. Which of the reasons on the card best represents your reason for saying that you would not be prepared to pay anything? *(Show respondents CARD 6.)*

- 1. I would not be prepared to pay any extra Council Tax to avoid a reduction in spending
- 2. I think that I am already paying enough in Council Tax for the council to continue to provide the current level of service
- 3. I am not convinced that the extra money would be used efficiently by the Council
- 4. I do not agree with this type of question
- 5. Some other reason (please specify).....

(If the respondent chooses option 2, go to Q9f. If the respondent chooses option 3, go to Q9g. Otherwise, go to Q15.)

Q9f If you could be assured that the only way to maintain the current level of service would be by increasing Council Tax, would you then be prepared to say by how much you would increase your Council Tax payments?

YES/NO (If yes, return to Q9c. If no, go to Q15.)

Q9g If you could be assured that the extra money would be used efficiently by the Council, would you then be prepared to say by how much you would increase your Council Tax payments?

YES/NO (If yes, return to Q9c. If no, go to Q15.)

Sell one of the parks

Q10a You have chosen the option to sell one of the parks in Northampton. Which park, in your opinion, should be the one to be sold?

Name of park.....

Q10b Is this the park that is closest to your home? YES/NO

(If no, go to Q10c. If yes, go to Q10e.)

Q10c Would you be prepared to see the Council sell the park closest to your home? YES/NO

(If no, go to Q10d. If yes, go to Q10e.)

Q10d If this park was the only one the Council could sell off, would you then prefer to choose the option that would mean reduced spending on the maintenance of parks? YES/NO

(If yes, return to Q9a. If no, go to Q10e.)

Q10e If the decision to sell one of the parks could be avoided by an increase in Council Tax, would you be willing to increase your annual Council Tax payments? YES/NO

(For non-residents, explain that the Council Tax could be raised through a Parish Precept payable to the Borough. If the respondent gives a "Zero" response, go to Q10h. Otherwise go to Q10f.)

- Q10f Would you be prepared to pay £10 extra Council Tax per year? YES/NO
- Would you be prepared to pay £25 extra Council Tax per year? YES/NO
- Would you be prepared to pay £50 extra Council Tax per year? YES/NO
- Would you be prepared to pay £100 extra Council Tax per year? YES/NO

(Circle the amount put to the respondent. If YES, go to Q11. If NO, go to Q10g.)

Q10g How much extra Council Tax per year would you be prepared to pay to avoid the sale of one of the parks? £.....

(Then go to Q11.)

Q10h People have different reasons for saying that they would not be prepared to pay anything. For some it is because they would actually like to see a park sold. For others, it is for different reasons. Which of the reasons on the card best represents your reason for saying that you would not be prepared to pay anything to avoid the sale of one of the town's parks? *(Show respondent CARD 7.)*

- 1. I would not be prepared to pay anything to avoid selling off one of the parks in Northampton
- 2. I am already paying enough in Council Tax for the council to continue to provide the current number of parks
- 3. I am not convinced that the extra money would be used efficiently
- 4. I do not agree with this type of question
- 5. Some other reason (please specify).....

(If the respondent chooses option 2, go to Q10j. If the respondent chooses option 3, go to Q10k. Otherwise, go to Q15.)

Q10j If you could be assured that the only way to maintain the current number of parks would be by increasing the Council Tax, would you then be prepared to say by how much you would increase your Council Tax payments?

YES/NO *(If yes, return to Q10f. If no, go to Q15.)*

Q10k If you could be assured that the extra money would be used efficiently by the Council, would you then be prepared to say by how much you would increase your Council Tax payments?

YES/NO *(If yes return to Q10f. If no, go to Q15.)*

Source of Payments

In response to the last question, you have said that you would be prepared to pay an extra £10/25/50/100 per year *(circle the appropriate amount)* £.....*(enter the appropriate amount from Q10g)* Council Tax. This additional spending you have said that you would be prepared to make on parks would need to come from some part of your current household spending. Household spending can be divided up into a number of different headings. *(Show respondent CARD 8.)*

Q11 From which of these headings would you make the savings to pay for your increased spending on parks? *(Advise respondents that they may choose more than one heading if they wish.)*

- Housing
- Food
- Energy Travel
- Entertainment Savings
- Other (please specify).....

Q12 What you are saying is that you would be willing to reduce your spending on
by £..... per year to pay for the increased spending on parks. Is this correct?

YES/NO

(If yes, go to Q13. If no, return to Q9b or Q10e and repose the question.)

Q13 If the Council found that the amount you suggested you would be prepared to pay were still insufficient to cover the cost of maintaining the current level of service, would you then be prepared to raise your amount to a higher figure?

YES/NO *(If yes go to Q14. If no, go to Q15.)*

Q14 What is the most your household would be willing to pay before you would feel that the amount being suggested is too high? *(Refer to the Council Tax amount already given.)*

£.....

Socio-economic characteristics

Finally, to assist us in considering how people use parks and value them, I would like to ask you a few questions about yourself.

Q15 Would you be prepared to say into which of the following ranges your age falls?

18-24 25-39 40-59 60+ No response

M/F

(Show the respondent CARD 9. If the respondent gives no answer, make an estimate using these categories. Also, make a note of the respondent's sex.)

Q16a Do you live within the area covered by Northampton Borough Council? YES/NO

(If yes, go to Q16b, if no go to Q16d.)

Q16b In which street in the Borough do you live?

.....

Q16c How long have you lived in the area covered by the Northampton Borough Council?
0-2 years 2-4 years 5-9 years 10 years+

(Place respondent's answer into one of these categories. Then go to Q17.)

Q16d How far away from the area do you live?

Less than 2 miles between 2-5 miles between 5-10 miles
More than 10 miles Don't know No response

(Place respondent's answer into one of these categories.)

Q17 Are you currently in employment?

YES/NO *(If yes, go to Q18a. If no, go to Q18c.)*

Q18a What is your occupation?.....

Q18b Into which of the following categories would you say that your occupation falls?

Manual Craft Clerical/Secretarial Technical
Administrative/Managerial Professional Sales
Personal Services Other (please specify).....

(Show respondent CARD 10. Then go to Q19.)

Q18c Which of the following best describes your present situation?

(Show respondent CARD 11.)

Unemployed At home Student Retired
Other (please specify)

Q19 Into which of the following categories does your household's income fall?

Less than £5 000	£5 000 to £10 000	£10 000 to £15 000
£15 000 to £20 000	£20 000 to £ 25 000	£30 000 to £35 000
More than £35 000		

(Show respondent CARD 12. Assist the respondent in identifying the appropriate annual figure if they identify their income in weekly or monthly terms. The income figure should be that for income before tax. It should also include the income of all members of the household and not just the respondent. Advise the respondent of these points.)

Q20 Which level of education given on the list have you currently reached? (Show respondent CARD 13.)

Professional qualification	Higher degree
HND or equivalent	Degree
Apprenticeship	"A"levels/BTEC Higher
No formal qualifications	"O"level/GCSE/BTEC National

Q21 Finally, I would like to ask you how sure you feel about the money amounts you indicated in the answers to the earlier questions, as some people vary in the certainty with which they answer these questions.

Would you say you are:

Very sure? Fairly sure? A little unsure? Very unsure?
Don't know Refused

Thank you for your time and help

Interviewer Assessment of Respondent

AQ1 How well do you think that the respondent understood the questions?

Very Well A Great Deal Somewhat
Not very well Not At All Difficult to tell

AQ2 How carefully did the respondent answer the questions?

- 1. Gave the questions prolonged consideration in order to arrive at a correct valuation.
- 2. Gave the questions careful consideration, but the effort was not prolonged.
- 3. Gave the questions some consideration.
- 4. Gave the questions very little consideration.

Location of interview.....
Date of interview.....
Interviewer.....

tjc
jan95

Appendix TWO

Pilot Survey Questionnaire (Entrance Fee as Payment Vehicle)

Questionnaire to evaluate the benefits associated with parks in Northampton (E)

Introduction

Hello! My name is Thomas Coskeran and I am a lecturer at Nene College here in Northampton. As part of my work at the College, I am carrying out some academic research, which will also form part of a PhD I am studying for at Warwick University.

The research involves me in talking to a number of people in the town to find out how they use the public services provided by Northampton Borough Council and how much these are worth to them. I would be grateful, therefore, if you would participate in a survey on this issue.

Before beginning to ask the questions, I would like to emphasize that in this exercise there are no right or wrong answers. It is what you think about the issues involved that is important.

Attitudes to Services

I would like to begin by asking you to consider this list of services provided by the Borough Council in Northampton. (*Show respondent CARD 1.*)

Q1 From what you know about these services in the town, could you say if you feel the amount being spent on them by the Council is a) Too much; b) About right; or c) Too little?

Too much	About right	Too little	Don't know	Refused
-------------	----------------	---------------	---------------	---------

Highways

Parks

Refuse
Collection

Housing

Recreation
& Tourism

(If respondent answers "too much" on park, go to Q2a. If respondent answers "too little" on park, go to Q3a. Otherwise, go to Q4.)

Q2a You said that the Council is spending "too much" money on parks. I would like to ask you more about this topic. In your opinion, do you think that the Council should be spending a great deal less or only a little less on parks?

A great deal less	A little less	Don't know	Refused
-------------------	---------------	------------	---------

Q2b If the Council were to reduce the amount spent on parks, how would you like the money saved to be used?

- a) More spending on one or more of the services listed (please specify)
(Show respondent CARD 1 again.)
- b) A reduction in Council Tax
- c) Other (please specify).....

(If an alternative service is suggested, remind respondents that the Borough Council is limited by statute in the sort of services it can deliver. Then go to Q4.)

Q3a You said that the Council is spending "too little" on parks. I would like to ask you more about this topic. In your opinion, do you think that the Council should be spending a great deal more or a little more on parks:

A great deal more A little more Don't know Refused

Q3b If the Council were to increase the amount spent on parks how would you like the money for this extra spending to be raised?

- a) By cutting spending on one or more of the services listed (please specify)
(Show the respondent CARD 1 again.)
- b) By raising Council Tax
- c) Other (please specify).....

Household Activities

I would now like to consider in more detail the way in which you use one of the services provided by the Borough Council. In particular, I would like to look at your use of the parks provided in the town by the Council.

Q4a Have you or any of the members of your household used any of the parks in Northampton for any activity during the last twelve months?

(If the respondent seems unsure about this question, mention that this could include activities such as walking, picnicking, sport, using children's facilities, attending a special event such as the Balloon Fair, enjoying the view, etc.)

YES/NO/Don't know

(If respondent answers YES, go to Q4b. If respondent answers NO, go to Q7.)

Q4b Please name the park or parks that you have used.

Name of park(s).....
Forgotten
Don't know

Q5 Please say for which of the following activities you used the park. *(Show respondent CARD 2.)*

	YES	NO	Don't know
Walking		
Picnicking		
Organized Sporting Activity		
Outing with children		
Enjoying the View		
Special event e.g. Balloon fair		
Other (please specify)		

Q6 When you visit a park in Northampton, which feature of the park would you say contributes most to your personal enjoyment? *(Show respondent CARD 3.)*

- Presence of flowers and plants
- Open Space
- Children's Play Area
- Peace and Quiet
- Facilities available (e.g.restaurant)
- Other (please specify)

Q7 Here are a number of reasons why people feel parks should be provided by the Council. Please read them through on the card. *(Show respondent CARD 4 and ask them to read through it.)*

Could you now indicate up to TWO reasons, if any, from the list which are important to you personally.*(Use numbers from list. For 1, indicate answer in brackets.)*

Hypothetical Scenario

I would now like you to imagine that the Council is considering a reduction in the amount it spends on parks. It has two options that it can adopt. It can either reduce spending on the maintenance of parks or it can sell one of the parks in the town.

Q8 Which of these two possibilities would be more acceptable to you? Would you prefer to:

- or

a) Reduce spending on the maintenance of parks and the facilities provided

b) Sell off one of the parks?

NeitherDon't know Refused

(If respondents indicate that choosing the selling option would depend upon what the land was used for after the sale, indicate that this should not be relevant to their decision. We are only interested to see if they would consider giving up one of the parks, albeit under certain conditions. If the respondent chooses the option to reduce spending, go to Q9a. If respondent chooses the option to sell, go to Q10a. If any other option is chosen, go to Q15.)

Reduce spending on maintenance

Q9a You have chosen the option to reduce spending on maintenance and facilities in parks. Which ONE of the following ways of reducing spending would you choose?
(Show respondents CARD 5.)

- 1. Less maintenance of flowers and plants in parks
- 2. A reduction in the maintenance of children's play areas
- 3. Closing toilet/nursing facilities
- 4. Reducing the number of "free" events in the parks
- 5. Other (please specify).....

Q9b Now imagine that the decision to cut spending on parks could be avoided by the Council introducing an entrance fee to parks so that you would pay each time you visited the park. Would you be prepared to pay such an entrance fee? YES/NO

(If the respondent replies "NO", go to Q9e. Otherwise go to Q9c.)

- Q9c** Would you be prepared to pay 50 pence per person for each visit? YES/NO
Would you be prepared to pay £1 per person for each visit? YES/NO
Would you be prepared to pay £1.50 per person for each visit? YES/NO
Would you be prepared to pay £2 per person for each visit? YES/NO

(Circle amount that is put to the respondent. If YES, go to Q11. If NO, go to Q9d.)

Q9d How much you would be prepared to pay as an entrance fee?

Q9e People have different reasons for saying that they would not be prepared to pay anything. For some it is because they would actually like to see a reduction in spending on parks. For others, it is for different reasons. Which of the reasons on the card best represents your reason for saying that you would not be prepared to pay anything? *(Show respondents CARD 6.)*

- 1. I would not be prepared to pay an entrance fee to avoid a reduction in spending on parks.
- 2. I think that I am already paying enough in Council Tax for the council to continue to provide the current level of service
- 3. I am not convinced that the extra money collected from the entrance fee would be used efficiently by the Council
- 4. I do not agree with the idea of paying an entrance fee to a park
- 5. Some other reason (please specify).....

(If the respondent chooses option 2, go to Q9f. If the respondent chooses option 3, go to Q9g. Otherwise, go to Q15.)

Q9f If you could be assured that the only way to maintain the current level of service would be by introducing an entrance fee to parks, would you then be prepared to say what level of entrance fee you would be willing to pay?

YES/NO *(If yes, return to Q9c. If no, go to Q15.)*

Q9g If you could be assured that the extra money obtained from the entrance fee would be used efficiently by the Council, would you then be prepared to say what level of entrance fee you would be willing to pay?

YES/NO *(If yes, return to Q9c. If no, go to Q15.)*

Sell one of the parks

Q10a You have chosen the option to sell one of the parks in Northampton. Which park, in your opinion, should be the one to be sold?

Q10b Is this the park that is closest to your home? **YES/NO**

(If no, go to Q10c. If yes, go to Q10e.)

Q10c Would you be prepared to see the Council sell off the park closest to your home?
YES/NO

(If no, go to Q10d. If yes, go to Q10e.)

Q10d If this park was the only one the Council could sell, would you then prefer to choose the option that would mean reduced spending on the maintenance of parks? **YES/NO**

(If yes, return to Q9a. If no, go to Q10e.)

Q10e If the decision to sell one of the parks could be avoided by the introduction of an entrance fee so that you would pay each time you visited the park, would you be prepared to say what level of entrance fee you would be prepared to pay ? **YES/NO**

(If the respondent replies "NO", go to Q10h. If YES, go to Q10f.)

Q10f Would you be prepared to pay 50 pence per person for each visit? **YES/NO**
Would you be prepared to pay £1 per person for each visit? **YES/NO**
Would you be prepared to pay £1.50 per person for each visit? **YES/NO**
Would you be prepared to pay £2 per person for each visit? **YES/NO**

(Circle amount that is put to the respondent. If YES, go to Q11. If NO, go to Q10g.)

Q10g How much you would be prepared to pay as an entrance fee?

(Then go to Q11.)

Q10h People have different reasons for saying that they would not be prepared to pay anything. For some it is because they would actually like to see a park sold. For others, it is for different reasons. Which of the reasons on the card best represents your reason for saying that you would not be prepared to pay anything to avoid the sale of one of the town's parks? *(Show respondent CARD 7.)*

- 1. I would not be prepared to pay an entrance fee to avoid selling off one of the parks in Northampton
- 2. I am already paying enough in Council Tax for the council to continue to provide the current number of parks
- 3. I am not convinced that the extra money would be used efficiently
- 4. I do not agree with this type of question
- 5. Some other reason (please specify).....

(If the respondent chooses option 2, go to Q10j. If the respondent chooses option 3, go to Q10k. Otherwise, go to Q15.)

Q10j If you could be assured that the only way to maintain the current number of parks would be by introducing an entrance fee, would you then be prepared to say what level of entrance fee you would be prepared to pay?

YES/NO *(If yes, return to Q10f. If no, go to Q15.)*

Q10k If you could be assured that the extra money would be used efficiently by the Council, would you then be prepared to say what level of entrance fee you would be willing to pay?

YES/NO *(If yes return to Q10f. If no, go to Q15.)*

Source of Payments

In response to the last question, you have said that you would be prepared to pay an entrance fee of 50 pence/£1/£1.50/£2 *(circle the appropriate amount)* *(enter appropriate amount)* per visit to the park for each person. The additional spending you have said you would be prepared to make on parks would need to come from some part of your current household spending. Household spending can be divided up into a number of different headings.

Q11 From which of these headings would you make the savings to pay for your increased spending on parks? *(Show respondent CARD 8. Advise respondents that they may choose more than one heading if they wish.)*

- Housing Food Energy Travel
- Entertainment Savings Other (please specify).....

Q12 What you are saying is that you would be willing to reduce your spending on

(enter the appropriate heading(s)) to pay for the increased spending on parks. Is this correct?

YES/NO *(If yes, go to Q13. If no, return to Q9b or Q10f and repose the question.)*

Q13 If the Council found that the amount you suggested you would be prepared to pay as an entrance fee were still not enough to cover the cost of maintaining the current level of service, would you then be prepared to raise your amount to a higher figure?

YES/NO (If yes go to Q14. If no, go to Q15.)

Q14 What is the most you think your household would be willing to pay as an entrance fee before you would feel that the amount being suggested is too high? (Refer to the entrance fee already agreed to by the respondent.)
£.....

Socio-economic characteristics

Finally, to assist us in considering how people use parks and value them, I would like to ask you a few questions about yourself.

Q15 Would you be prepared to say into which of the following ranges your age falls?

18-24 25-39 40-59 60+ No response
M/F

(Show respondent CARD 9. If the respondent gives no answer, make an estimate using these categories. Also, make a note of the respondent's gender.)

Q16a Do you live within the area covered by Northampton Borough Council? YES/NO

(If yes, go to Q16b, if no go to Q16d.)

Q16b In which street in the Borough do you live?.....

Q16c How long have you lived in the area covered by the Northampton Borough Council?

0-2 years 2-4 years 5-9 years 10+years

(Place respondent's answer into one of these categories. Then go to Q17.)

Q16d How far away from the area do you live?

Less than 2 miles Between 2 and 5 miles Between 5 and 10 miles
More than 10 miles Don't know No response

(Place respondent's answer into one of these categories.)

Q17 Are you currently in employment?

YES/NO (If yes, go to Q18a. If no go to Q18c.)

Q18a What is your occupation?

Q18b Into which of the following categories would you say that your occupation falls?

- Manual
- Craft
- Clerical/Secretarial
- Technical
- Administrative/Managerial
- Professional
- Sales
- Personal Services
- Other (please specify).....

(Show respondent CARD 10. Then go to Q19.)

Q18c Which of the following best describes your present situation?

(Show respondent CARD 11.)

- Unemployed
- At home
- Student
- Retired
- Other (please specify).....

Q19 Into which of the following categories does your household's income fall?

- Less than £5 000
- £5 000 to £10 000
- £10 000 to £15 000
- £15 000 to £20 000
- £20 000 to £ 25 000
- £30 000 to £35 000
- More than £35 000

(Show respondent CARD 12. Assist the respondent in identifying the appropriate annual figure if they identify their income in weekly or monthly terms. The income given should be the gross income of the household and should, therefore, include the income of other members of the household apart from the respondent.)

Q20 Which level of education given on the list have you currently reached? *(Show respondent CARD 13.)*

- Professional qualification
- Higher degree
- HND or equivalent
- Degree
- Apprenticeship
- "A"levels/BTEC Higher
- No formal qualifications
- "O"level/GCSE/BTEC National

Q21 Finally, I would like to ask you how sure you feel about the money amounts you indicated in the answers to the earlier questions, as some people vary in the certainty with which they answer these questions.

Would you say you are:

- Very sure?
- Fairly sure?
- A little unsure?
- Very unsure?
- Don't know
- Refused

Thank you for your time and help.

Interviewer Assessment of Respondent

AQ1 How well do you think that the respondent understood the questions?
Very Well A Great Deal Somewhat
Not very well Not At All Difficult to tell

AQ2 How carefully did the respondent answer the questions?

- 1. Gave the questions prolonged consideration in order to arrive at a correct valuation.
- 2. Gave the questions careful consideration, but the effort was not prolonged.
- 3. Gave the questions some consideration.
- 4. Gave the questions very little consideration.

Location of interview.....

Date of interview.....

Interviewer.....

tjc
jan95

Appendix THREE

Pilot Survey Flash Cards

CARD 1

Q1 SERVICES PROVIDED BY THE BOROUGH COUNCIL

Highways

Parks

Refuse Collection and Disposal

Housing

Recreation and Tourism

CARD 2

Q5

Walking

Picnicking

Organized Sporting Activity

Outing with children

Enjoying the View

Special event e.g. Balloon fair

Other (please specify)

CARD 3

Q6

Presence of flowers and plants

Open Space

Children's Play Area

Peace and Quiet

Facilities available (e.g.restaurant)

Other (please specify)

CARD 4

Q7

1. Your own/household's use of the parks for.....(please specify)
2. You get satisfaction from knowing that other people may use and enjoy the parks.
3. You get satisfaction from knowing that the environment is cleaner in Northampton when there are parks in the town.
4. You get satisfaction from knowing that future generations will be able to use and enjoy the parks.
5. You get satisfaction from knowing that those on lower incomes do not have to pay for the park when they use it.
6. No reason

CARD 5

Q9a

1. Less maintenance of flowers and plants in parks
2. A reduction in the maintenance of children's play areas
3. Closing toilet/nursing facilities
4. Reducing the number of "free" events in the parks
5. Other (please specify)

CARD 6

Q9d (Council Tax)

1. I would not be prepared to pay any extra Council Tax to avoid a reduction in spending
2. I think that I am already paying enough in Council Tax for the council to continue to provide the current level of service
3. I am not convinced that the extra money would be used efficiently by the Council
4. I do not agree with this type of question
5. Some other reason (please specify)

CARD 6

Q9d (Entrance fee)

1. I would not be prepared to pay an entrance fee to avoid a reduction in spending on parks.
2. I think that I am already paying enough in Council Tax for the council to continue to provide the current level of service
3. I am not convinced that the extra money collected from the entrance fee would be used efficiently by the Council
4. I do not agree with the idea of paying an entrance fee to a park
5. Some other reason (please specify)

CARD 7

Q10g

1. I would not be prepared to pay anything to avoid selling one of the parks in Northampton
2. I am already paying enough in Council Tax for the council to continue to provide the current number of parks
3. I am not convinced that the extra money would be used efficiently
4. I do not agree with this type of question
5. Some other reason (please specify)

CARD 8

Q11

Housing

Food

Energy

Travel

Entertainment

Savings

Other (please specify)

CARD 9

Q15

18-24

25-39

40-59

60+

CARD 10

Q18b

Manual

Craft

Clerical/Secretarial

Technical

Administrative/Managerial

Professional

Sales

Personal Services

Other (please specify)

CARD 11

Q18c

Unemployed

At home

Student

Retired

Other (please specify)

CARD 12

Q19

Less than £5 000

£5 000 to £10 000

£10 000 to £15 000

£15 000 to £20 000

£20 000 to £25 000

£25 000 to £30 000

£30 000 to £35 000

More than £35 000

CARD 13

Q20

Professional qualification

Higher degree

HND or equivalent

Degree

Apprenticeship

"A"levels/BTEC Higher

No formal qualifications

"O"level/GCSE/BTEC National

Appendix FOUR

Letter Sent to Pilot Survey Sample

The Occupier
street~
NORTHAMPTON
POSTCODE~

Date req/1

Dear Sir/Madam,

As part of some academic research I am doing at Nene College, I am carrying out a survey in Northampton that involves asking people about their attitudes towards some of the services provided by the Borough Council in the town. To conduct the survey, I have drawn up a list, at random, of addresses in Northampton and yours is one of those that has been selected.

The main purpose of this letter is to give you advance warning that I will be calling to your house one evening next week between 6 and 8 pm. If it would be convenient for me to ask you some questions at that time, I would hope that my visit should last no more than 15 to 20 minutes.

Should you have any questions that you would like to raise with me about the survey, or if it would be inconvenient for me to call at the time I have suggested, please contact me at the College, and I will do my best to answer any concerns you may have about the survey.

I look forward to meeting you next week,

Yours faithfully,

T Coskeran
Senior Lecturer in Economics

Appendix FIVE

Follow-up letter to Pilot Sample

The Occupier
street~
NORTHAMPTON
POSTCODE~

Date res/1

Dear Sir/Madam,

I recently called to your home and asked you to take part in a survey I am conducting.

Although you could not take part in the survey, I am now writing to ask if you could answer the questions on the attached form and return it to me in the enclosed stamped addressed envelope. This form, I should emphasize, will only take a few seconds to complete.

Finally, I am sorry that my original call was at a bad time for you. If, however, you would now be able to answer a few questions, please let me know on the attached form and I will contact you again to arrange to call at a time that is convenient for you,

Yours sincerely,

T Coskeran
Senior Lecturer in Economics

SURVEY INTO ATTITUDES TOWARDS COUNCIL SERVICES

I did not wish to take part in the survey because (please tick the appropriate box):

- ☐ I do not like taking part in surveys of any type
- ☐ I do not like letting strangers into my home
- ☐ The caller did not clearly explain the reason for the survey
- ☐ I have no opinions on Council services
- ☐ Of some other reason(s) (please specify)

.....
.....

IF YOU WOULD NOW BE PREPARED TO TAKE PART IN THE SURVEY, PLEASE COMPLETE THE FOLLOWING:

- 1. What is your address?

- 2. Which day or days would be most convenient for you to be visited?

- 3. What time of the day would be most convenient?

tjc/2/95

Appendix SIX

Main Survey Questionnaire

Questionnaire to evaluate the benefits associated with parks in Northampton

Introduction

Hello! I am from Nene College here in Northampton. We wrote to you last week about taking part in a survey into attitudes towards Council services in Northampton. Would it be convenient for you to answer a few questions now?

(Note: If the respondent is unable to see you at that time, make another appointment.)

Before beginning to ask the questions, I would like to emphasize that in this exercise there are no right or wrong answers. It is what you think about the issues involved that is important.

Attitudes to Services

I would like to begin by asking you to consider this list of services provided by the Borough Council in Northampton. *(Show respondent CARD 1.)*

Q1 From what you know about these services in the town, could you say if you feel the amount being spent on them by the Council is a) Too much; b) About right; or c) Too little?

	Too much .01	About right .02	Too little .03	Don't know .04	Refused .05
1.1 Highways	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2 Parks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3 Refuse Collection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.4 Housing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.5 Recreation & Tourism	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(If respondent answers "too much" on park, go to Q2a. If respondent answers "too little" on park, go to Q3a. Otherwise, go to Q4.)

Q2a You said that the Council is spending "too much" money on parks. I would like to ask you more about this topic. In your opinion, do you think that the Council should be spending a great deal less or only a little less on parks?

2.1 A great deal less ☐ 2.2 A little less ☐ 2.3 Don't know ☐ 2.4 Refused ☐

Q2b If the Council were to reduce the amount spent on parks, how would you like the money saved to be used?

- a) More spending on one or more of the services listed (please specify) (Show respondent CARD 1 again.) ☐ 2.5
- b) A reduction in Council Tax ☐ 2.6
- c) Other (please specify)..... 2.7

(If an alternative service is suggested, remind respondents that the Borough Council is limited by statute in the sort of services it can deliver. Then go to Q4.)

Q3a You said that the Council is spending "too little" on parks. I would like to ask you more about this topic. In your opinion, do you think that the Council should be spending a great deal more or a little more on parks:

- 3.1 A great deal more ☐
- 3.2 A little more ☐
- 3.3 Don't know ☐
- 3.4 Refused ☐

Q3b If the Council were to increase the amount spent on parks how would you like the money for this extra spending to be raised?

- a) By cutting spending on one or more of the services listed ☐ (please specify) (Show the respondent CARD 1 again.) 3.5
- b) By raising Council Tax ☐ 3.6
- c) Other (please specify)..... 3.7

Household Activities

I would now like to consider in more detail the way in which you use one of the services provided by the Borough Council. In particular, I would like to look at your use of the parks provided in the town by the Council.

Q4a Have you or any of the members of your household used any of the parks in Northampton for any activity during the last twelve months?

(If the respondent seems unsure about this question, mention that this could include activities such as walking, picnicking, sport, using children's facilities, attending a special event such as the Balloon Fair, enjoying the view, etc.)

- YES ☐
- NO ☐
- Don't know ☐

(If respondent answers YES, go to Q4b. If respondent answers NO, go to Q7.)

Q4b Please name the park or parks that you have used.

- Name of park(s)..... 4.4
- Forgotten ☐ 4.5
- Don't know ☐ 4.6

Q5 Please say for which of the following activities you used the park. *(Show respondent CARD 2.)*

	.01	.02	.03
	YES	NO	Don't know
5.1 Walking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2 Picnicking <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5.3 Organized Sporting Activity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.4 Outing with children	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.5 Enjoying the View	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.6 Special event e.g. Balloon fair	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.7 Other (please specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q6 When you visit a park in Northampton, which feature of the park would you say contributes most to your personal enjoyment? *(Show respondent CARD 3.)*

- 6.1 Presence of flowers and plants ☐
- 6.2 Open Space ☐

- 6.3 Children's Play Area ☐
- 6.4 Peace and Quiet ☐
- 6.5 Facilities available (e.g.restaurant) ☐
- Other (please specify).....

Q7 Here are a number of reasons why people feel parks should be provided by the Council. Please read them through on the card. *(Show respondent CARD 4 and ask them to read through it.)*

- 1. Your own/household's use of the parks for.....(please specify) ☐
- 2. You get satisfaction from knowing that other people may use and enjoy the parks ☐
- 3. You get satisfaction from knowing that the environment is cleaner in Northampton when there are parks in the town ☐
- 4. You get satisfaction from knowing that future generations will be able to use and enjoy the parks ☐
- 5. You get satisfaction from knowing that those on lower incomes do not have to pay for the park when they use it ☐
- 6. No reason ☐

Please indicate up to TWO reasons, if any, from the list which are important to you personally.

Hypothetical Scenario

I would now like you to imagine that the Council is considering a reduction in the amount it spends on parks. It has two options that it can adopt. It can either reduce spending on the maintenance of parks or it can sell one of the parks in the town.

Q8a Which of these two possibilities would be more acceptable to you? Would you prefer to:

- 8.1 a) Reduce spending on the maintenance of parks and the facilities provided ☐
- 8.2 b) Sell one of the parks? ☐
- 8.3 Neither ☐ 8.4 Don't know ☐ 8.5 Refused ☐

(If respondents indicate that choosing the selling option would depend upon what the land was used for after the sale, indicate that this should not be relevant to their decision. We are only interested to see if they would consider giving up one of the parks, albeit under certain conditions. If the respondent chooses the option to reduce spending on maintenance, go to Q8b. If respondent chooses the option to sell, go to Q8c. If any other option is chosen, go to Q15.)

Reduce spending on maintenance

Q8b You have chosen the option to reduce spending on maintenance and facilities in parks. Which ONE of the following statements most closely corresponds to your reason for choosing this option? *(Show the respondent CARD 5.)*

- 1. I believe that parks should be retained for the use of future generations ☐ 8.6
- 2. I think that too much is currently being spent on maintenance and facilities in parks ☐ 8.7
- 3. I understand that there are legal reasons why parks in Northampton cannot be sold by the Council ☐ 8.8
- 4. I think that parks are still a valuable environmental asset for the town even when less is spent on maintenance and facilities ☐ 8.9
- 5. Other reason (please specify) 8.10

(Then go to Q9a)

Q8c You have chosen the option to sell one of the parks in Northampton. Which ONE of the following statements most closely corresponds to your reason for choosing this option? *(Show the respondent CARD 6.)*

- 1. I think that there are too many parks at present in Northampton ☐ 8.11
- 2. I think that it is better to have a few well maintained parks rather than a large number of poorly maintained parks ☐ 8.12
- 3. I think that there are legal obstacles to reducing maintenance and facilities in parks ☐ 8.13
- 4. I think that some of the land used for parks would be better used for other purposes ☐ 8.14
- 5. Other reason (please specify)..... 8.15

(Then go to Q10a)

Reduce spending on maintenance

Q9a As you have chosen the option to reduce spending on maintenance and facilities in parks, which ONE of the following ways of reducing spending would you choose?
(Show respondents CARD 7.)

- 9.1 1. Less maintenance of flowers and plants in parks ☐
- 9.2 2. A reduction in the maintenance of children's play areas ☐
- 9.3 3. Closing toilet/nursing facilities ☐
- 9.4 4. Reducing the number of "free" events in the parks ☐
- 9.5 5. Other (please specify).....

Q9b Now imagine that the decision to cut spending on parks could be avoided by an increase in Council Tax. Would you be willing to increase your annual Council Tax payments to avoid the cut in spending on park maintenance? YES ☐ NO ☐

9.61/9.62

(For non-residents, explain that the Council Tax could be raised through a Parish Precept payable to the Borough. If the respondent replies "NO", go to Q9e. Otherwise go to Q9c. Respondents can also be shown the current Council Tax bands to give them an idea of current payment levels.)

Q9c

- 9.71 Would you be prepared to pay £25 extra Council Tax per year? YES ☐ NO ☐
- 9.72 Would you be prepared to pay £50 extra Council Tax per year? YES ☐ NO ☐
- 9.73 Would you be prepared to pay £100 extra Council Tax per year? YES ☐ NO ☐

(Circle the amount put to the respondent. If YES, go to Q11. If NO, go to Q9d. Select the level of Council Tax put to the respondent in rotation.)

Q9d How much extra Council Tax per year would you be prepared to pay to maintain the current level of spending on the maintenance of parks? £..... 9.8 (Then go to Q11.)

Q9e People have different reasons for saying that they would not be prepared to pay anything. For some it is because they would actually like to see a reduction in spending on parks. For others, it is for different reasons. Which of the reasons on the card best represents your reason for saying that you would not be prepared to pay anything? (Show respondents CARD 8.)

- 1. I would not be prepared to pay any extra Council Tax to avoid a reduction in spending ☐ 9.91
- 2. I think that I am already paying enough in Council Tax for the council to continue to provide the current level of service ☐ 9.92
- 3. I am not convinced that the extra money would be used efficiently by the Council ☐ 9.93
- 4. I do not agree with this type of question ☐ 9.94
- 5. Some other reason (please specify)..... 9.95

(If the respondent chooses option 2, go to Q9f. If the respondent chooses option 3, go to Q9g. Otherwise, go to Q15.)

Q9f If you could be assured that the only way to maintain the current level of service would be by increasing Council Tax, would you then be prepared to say by how much you would increase your Council Tax payments?

YES ☐ NO ☐ (If yes, return to Q9c. If no, go to Q15.)
9.101/9.102

Q9g If you could be assured that the extra money would be used efficiently by the Council, would you then be prepared to say by how much you would increase your Council Tax payments?

YES ☐ NO ☐ (If yes, return to Q9c. If no, go to Q15.)

Sell one of the parks

Q10a You have chosen the option to sell one of the parks in Northampton. Which park, in your opinion, should be the one to be sold?

Name of park..... 10.1

Q10b Is this the park that is closest to your home? YES ☐ NO ☐ 10.21/10.22

(If no, go to Q10c. If yes, go to Q10e.)

Q10c Would you be prepared to see the Council sell the park closest to your home?
YES ☐ NO ☐ 10.31/10.32

(If no, go to Q10d. If yes, go to Q10e.)

Q10d If this park was the only one the Council could sell, would you then prefer to choose the option that would mean reduced spending on the maintenance of parks? YES ☐ NO ☐
10.41/10.42

(If yes, return to Q9a. If no, go to Q10e.)

Q10e If the decision to sell one of the parks could be avoided by an increase in Council Tax, would you be willing to increase your annual Council Tax payments? YES ☐ NO ☐
10.51/10.52

(For non-residents, explain that the Council Tax could be raised through a Parish Precept payable to the Borough. If the respondent gives a "Zero" response, go to Q10h. Otherwise go to Q10f.)

Q10f
Would you be prepared to pay £25 extra Council Tax per year? YES ☐ NO ☐ 10.61/10.62
Would you be prepared to pay £50 extra Council Tax per year? YES ☐ NO ☐ 10.63/10.64
Would you be prepared to pay £100 extra Council Tax per year? YES ☐ NO ☐ 10.65/10.66
(Circle the amount put to the respondent. If YES, go to Q11. If NO, go to Q10g. Select the level of Council Tax put to the respondent in rotation.)

Q10g How much extra Council Tax per year would you be prepared to pay to avoid the sale of one of the parks? £..... 10.7

(Then go to Q11.)

Q10h People have different reasons for saying that they would not be prepared to pay anything. For some it is because they would actually like to see a park sold. For others, it is for different reasons. Which of the reasons on the card best represents your reason for saying that you would not be prepared to pay anything to avoid the sale of one of the town's parks? (Show respondent CARD 9.)

- 1. I would not be prepared to pay anything to avoid selling one of the parks in Northampton ☐ 10.81
- 2. I am already paying enough in Council Tax for the council to continue to provide the current number of parks ☐ 10.82
- 3. I am not convinced that the extra money would be used efficiently ☐ 10.83
- 4. I do not agree with this type of question ☐ 10.84
- 5. Some other reason (please specify)..... 10.85

(If the respondent chooses option 2, go to Q10j. If the respondent chooses option 3, go to Q10k. Otherwise, go to Q15.)

Q10j If you could be assured that the only way to maintain the current number of parks would be by increasing the Council Tax, would you then be prepared to say by how much you would increase your Council Tax payments?

YES ☐ NO ☐ (If yes, return to Q10f. If no, go to Q15.)
10.91/10.92

Q10k If you could be assured that the extra money would be used efficiently by the Council, would you then be prepared to say by how much you would increase your Council Tax payments?

YES ☐ NO ☐ (If yes return to Q10f. If no, go to Q15.)
10.101/10.102

Source of Payments

In response to the last question, you have said that you would be prepared to pay an extra £25/50/100 per year (circle the appropriate amount) £.....(enter the appropriate amount from Q9d or Q10g) Council Tax. This additional spending you have said that you would be prepared to make on parks would need to come from some part of your current household spending. Household spending can be divided up into a number of different headings. (Show respondent CARD 10.)

Q11 From which ONE of these headings would you be most likely to make the savings to pay for your increased spending on parks?

Housing <input type="checkbox"/> 11.1	Food <input type="checkbox"/> 11.2	Energy <input type="checkbox"/> 11.3	Travel <input type="checkbox"/> 11.4
Entertainment <input type="checkbox"/> 11.5	Savings <input type="checkbox"/> 11.6	Other (please specify)..... 11.7	

Q12 What you are saying is that you would be willing to reduce your spending on
by £..... per year to pay for the increased spending on parks. Is this correct?

YES ☐ NO ☐
12.1/12.2

(If yes, go to Q13. If no, return to Q9b or Q10e and repose the question.)

Q13 If the Council found that the amount you suggested you would be prepared to pay were still insufficient to cover the cost of maintaining the current level of service, would you then be prepared to raise your amount to a higher figure?

YES ☐ NO ☐ *(If yes go to Q14. If no, go to Q15.)*
13.1/13.2

Q14 What is the most your household would be willing to pay before you would feel that the amount being suggested is too high? *(Refer to the Council Tax amount already given.)*

£..... 14.1

Socio-economic characteristics

To assist us in considering how people use parks and value them, I would like to ask you a few questions about yourself.

Q15a Would you be prepared to give your age? YES ☐ NO ☐ Age..... 15.1

(If yes, obtain age and go to Q16. If no, go to Q15b.)

Q15b Would you be prepared to say into which of the following ranges your age falls?

18-24 ☐ 25-39 ☐ 40-59 ☐ 60+ ☐ No response ☐

15.1 15.3 15.4 15.5 15.6

M ☐ F ☐

15.7/15.8

(Show the respondent CARD 11. If the respondent gives no answer, make an estimate using these categories. Also, make a note of the respondent's sex.)

Q16a Do you live within the area covered by Northampton Borough Council? YES ☐ NO ☐

(If yes, go to Q16b, if no go to Q17.)

Q16b How long have you lived in the area covered by the Northampton Borough Council?
Number of years..... 16.3
(Also, place respondent's answer into one of these categories. Then go to Q17.)

- | | | | |
|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| 0-2 years <input type="checkbox"/> | 2-4 years <input type="checkbox"/> | 5-9 years <input type="checkbox"/> | 10 years+ <input type="checkbox"/> |
| 16.4 | 16.5 | 16.6 | 16.7 |

Q17 Are you currently in employment?

YES ☐ NO ☐ *(If yes, go to Q18a. If no, go to Q18c.)*
17.1/17.2

Q18a What is your occupation?..... 18.1

Q18b Into which of the following categories would you say that your occupation falls?

- Manual ☐ 18.2 Craft ☐ 18.3 Clerical/Secretarial ☐ 18.4 Technical ☐ 18.5
Administrative/Managerial ☐ 18.6 Professional ☐ 18.7 Sales ☐ 18.8
Personal Services ☐ 18.9 Other (please specify)..... 18.10

(Show respondent CARD 12. Then go to Q19.)

Q18c Which of the following best describes your present situation?

(Show respondent CARD 13.)

- Unemployed ☐ 18.11 At home ☐ 18.12 Student ☐ 18.13 Retired ☐ 18.14
Other (please specify)..... 18.5

Q19 Would you be prepared to say into which of the following categories your household's income falls?

- | | | |
|--|---|---|
| <input type="checkbox"/> Less than £5 000 19.1 | <input type="checkbox"/> £5 000 to £10 000 19.2 | <input type="checkbox"/> £10 000 to £15 000 19.3 |
| <input type="checkbox"/> £15 000 to £20 000 19.4 | <input type="checkbox"/> £20 000 to £ 25 000 19.5 | <input type="checkbox"/> £25 000 to £ 30 000 19.6 |
| <input type="checkbox"/> £30 000 to £35 000 19.7 | <input type="checkbox"/> More than £35 000 19.8 | |

(Show respondent CARD 14. Assist the respondent in identifying the appropriate annual figure if they identify their income in weekly or monthly terms. The income figure should be that for income before tax. It should also include the income of all members of the household and not just the respondent. Advise the respondent of these points.)

Q20 Which level of education given on the list have you currently reached? *(Show respondent CARD 15.)*

- | | |
|--|---|
| <input type="checkbox"/> Professional qualification 20.1 | <input type="checkbox"/> Higher degree 20.2 |
| <input type="checkbox"/> HND or equivalent 20.3 | <input type="checkbox"/> Degree 20.4 |
| <input type="checkbox"/> Apprenticeship 20.5 | <input type="checkbox"/> "A"levels/BTEC Higher 20.6 |
| <input type="checkbox"/> No formal qualifications 20.7 | <input type="checkbox"/> "O"level/GCSE/BTEC National 20.8 |

Q21a Are you a member of any group interested in environmental issues? YES ☐ NO ☐
21.1/21.2

(If yes, go to Q21b. If no, go to Q22.)

Q21b Of which group or groups are you a member? 21.3

Q22 Finally, I would like to ask you how sure you feel about the money amounts you indicated in the answers to the earlier questions, as some people vary in the certainty with which they answer these questions.

Would you say you are:

22.1 Very sure? ☐ 22.2 Fairly sure? ☐ 22.3 A little unsure? ☐ 22.4 Very unsure? ☐
22.5 Don't know ☐ 22.6 Refused ☐

Thank you for your time and help.

Interviewer Assessment of Respondent.

AQ1 How well do you think that the respondent understood the questions?

Very Well ☐ A Great Deal ☐ Somewhat ☐
Not very well ☐ Not At All ☐ Difficult to tell ☐

AQ2 How carefully did the respondent answer the questions?

- 1. Gave the questions prolonged consideration in order to arrive at a correct valuation. ☐
- 2. Gave the questions careful consideration, but the effort was not prolonged. ☐
- 3. Gave the questions some consideration. ☐
- 4. Gave the questions very little consideration. ☐

AQ3 The respondent's final willingness to pay was £.....

Location of interview..... Date of interview.....

Interviewer.....

tjc
nov95

Appendix SEVEN

Main Survey Flash Cards

CARD 1

Q1 SERVICES PROVIDED BY THE BOROUGH COUNCIL

Highways

Parks

Refuse Collection and Disposal

Housing

Recreation and Tourism

CARD 2

Q5

Walking

Picnicking

Organized Sporting Activity

Outing with children

Enjoying the View

Special event e.g. Balloon fair

Other (please specify)

CARD 3

Q6

Presence of flowers and plants

Open Space

Children's Play Area

Peace and Quiet

Facilities available (e.g. restaurant)

Other (please specify)

CARD 4

Q7

1. Your own/household's use of the parks for.....(please specify)
2. You get satisfaction from knowing that other people may use and enjoy the parks.
3. You get satisfaction from knowing that the environment is cleaner in Northampton when there are parks in the town.
4. You get satisfaction from knowing that future generations will be able to use and enjoy the parks.
5. You get satisfaction from knowing that those on lower incomes do not have to pay for the park when they use it.
6. No reason

CARD 5

Q8b

- 1. I believe that parks should be retained for the use of future generations
- 2. I think that too much is currently being spent on maintenance and facilities in parks
- 3. I understand that there are legal reasons why parks in Northampton cannot be sold by the Council
- 4. I think that parks are still a valuable environmental asset for the town even when less is spent on maintenance and facilities
- 5. Other reason (please specify).....

CARD 6

Q8c

- 1. I think that there are too many parks at present in Northampton
- 2. I think that it is better to have a few well maintained parks rather than a larger number of poorly maintained parks
- 3. I think that there are legal obstacles to reducing maintenance and facilities in parks
- 4. I think that some of the land used for parks would be better used for other purposes
- 5. Other reason (please specify).....

CARD 7

Q9a

1. Less maintenance of flowers and plants in parks
2. A reduction in the maintenance of children's play areas
3. Closing toilet/nursing facilities
4. Reducing the number of "free" events in the parks
5. Other (please specify)

CARD 8

Q9e

1. I would not be prepared to pay any extra Council Tax to avoid a reduction in spending
2. I think that I am already paying enough in Council Tax for the council to continue to provide the current level of service
3. I am not convinced that the extra money would be used efficiently by the Council
4. I do not agree with this type of question
5. Some other reason (please specify)

CARD 9

Q10h

1. I would not be prepared to pay anything to avoid selling one of the parks in Northampton
2. I am already paying enough in Council Tax for the council to continue to provide the current number of parks
3. I am not convinced that the extra money would be used efficiently
4. I do not agree with this type of question
5. Some other reason (please specify)

CARD 10

Q11

Housing

Food

Energy

Travel

Entertainment

Savings

Other (please specify)

CARD 11

Q15

18-24

25-39

40-59

60+

CARD 12

Q18b

Manual

Craft

Clerical/Secretarial

Technical

Administrative/Managerial

Professional

Sales

Personal Services

Other (please specify)

CARD 13

Q18c

Unemployed

At home

Student

Retired

Other (please specify)

CARD 14

Q19

Less than £5 000

£5 000 to £10 000

£10 000 to £15 000

£15 000 to £20 000

£20 000 to £25 000

£25 000 to £30 000

£30 000 to £35 000

More than £35 000

CARD 15

Q20

Professional qualification

Higher degree

HND or equivalent

Degree

Apprenticeship

"A"levels/BTEC Higher

No formal qualifications

"O"level/GCSE/BTEC National

Appendix EIGHT

Letters to Main Survey Sample

The Occupier
street~
NORTHAMPTON
POSTCODE~

Date req1

Dear Sir/Madam,

As part of some academic research I am doing at Nene College, I am carrying out a survey in Northampton that involves asking people about their attitudes towards some of the services provided by the Borough Council in the town. To conduct the survey, I have drawn up a random list from the electoral register of addresses in Northampton and yours is one of those to have been selected.

The main purpose of this letter is to give you advance warning that I will be calling to your house one evening next week between 6 and 9 pm. If it would be convenient for me to ask you some questions at that time, I would hope that my visit should last no more than 15 to 20 minutes.

Should you have any questions that you would like to raise with me about the survey, or if it would be inconvenient for me to call at the time suggested, please contact me at the College either in writing or by telephone between 9 am and 5 pm.

I look forward to meeting you next week,

Yours faithfully

Thomas Coskeran
Senior Lecturer in Economics

The Occupier
street~
NORTHAMPTON
POSTCODE~

Date req/1

Dear Sir/Madam,

As part of some academic research we are doing at Nene College, we are carrying out a survey in Northampton that involves asking people about their attitudes towards some of the services provided by the Borough Council in the town. To conduct the survey, we have drawn up a random list from the electoral register of addresses in Northampton and yours is one of those to have been selected.

The main purpose of this letter is to give you advance warning that Gareth James, one of our students, will be calling to your house one evening next week between 6 and 9 pm. If it would be convenient for him to ask you some questions at that time, I would hope that his visit should last no more than 15 to 20 minutes.

Should you have any questions that you would like to raise with me about the survey, or if it would be inconvenient for Gareth to call at the time suggested, please contact me at the College.

Yours faithfully,

T Coskeran
Senior Lecturer in Economics

BIBLIOGRAPHY

- Adamowicz W and V Bhardwaj (1993), Experiments on the difference between willingness to pay and willingness to accept, *Land Economics*, 69 (November): 416-427
- Adkinson A (1980), *The Parks of Northampton*, Northampton Borough Council, Northampton
- Ajzen I, T Brown and L Rosenthal (1996), Information Bias in Contingent Valuation: Effects of Personal Relevance, Quality of Information and Motivational Orientation, *Journal of Environmental Economics and Management*, 30: 43-57
- Akaike H (1981), Likelihood of a Model and Information Criteria, *Journal of Econometrics*, 16: 3-14
- Aldred J (1994), Existence Value, Welfare and Altruism, *Environmental Values*, Winter 1994: 381-402
- Altaf M and J Hughes (1994), Measuring the Demand for Improved Urban Sanitation Services: Results of a Contingent Valuation Study in Ouagadougou, Burkina Faso, *Urban Studies*, Vol 31, No 10 (December 1994): 1763-1776
- Altaf M, D Whittington, H Jamal and V Smith (1993), Rethinking rural water supply policy in the Punjab, Pakistan, *Water Resources Research*, 29(7): 1943-1954
- Alberini A (1995), Testing Willingness-to-pay Models of Discrete Choice Contingent Valuation Survey Data, *Land Economics*, 71 (February): 83-95
- Alberini A, M Cropper, T-T Fu, A Krupnick, J-T Liu, D Shaw and W Harrington (1997), Valuing Health Effects of Air Pollution in Developing Countries: The Case of Taiwan, *Journal of Environmental Economics and Management*, 34: 107-126
- Amemiya T (1973), Regression Analysis when the Dependent Variable is Truncated Normal, *Econometrica*, 41: 997-1016
- Andreoni J (1989), Giving with Impure Altruism: Applications to Charity and Ricardian Equivalence, *Journal of Political Economy*, 97(6): 1447-1458
- Arrow K, R Solow, P Portney, E Leamer, R Radner and H Schuman (1993), *Report of the NOAA Panel on Contingent Valuation*, National Oceanic and Atmospheric Administration, Washington DC
- Atkinson A and J Stiglitz (1980), *Lectures on Public Economics*, McGraw-Hill International, London

- Barty-King H (1985), *Expanding Northampton*, Secker and Warburg, London
- Bate R (1993), Pick a Number: A Critique of Contingent Valuation Methodology and its Application in Public Policy, *Competitive Enterprise Institute Working Paper*, December 1993
- Bateman I and I Langford (1997), Non-users' willingness to pay for a National Park: An Application and Critique of the Contingent Valuation Method, *Regional Studies*, Vol 31:571-582
- Bateman I, I Langford, R K Turner, K Willis and G Garrod (1995), Elicitation and truncation effects in contingent valuation studies, *Ecological Economics*, 12 (1995): 161-179
- Bateman I, K Willis and G Garrod (1994), *Consistency between Contingent Valuation Studies: a Comparison of Two Studies of UK National Parks*, *Regional Studies*, 28(5): 457-474
- Beckerman W (1994), 'Sustainable Development', *Environmental Values*, Vol 3 (Autumn 1994): 189-209
- Bennett R and D Larson (1996), Contingent Valuation of the Perceived Benefits of Farm Welfare Legislation: an Exploratory Survey, *Journal of Agricultural Economics*, 47(2), May 1996: 224-235
- Bergstrom T, L Blume and H Varian (1986), On the Private Provision of Public Goods, *Journal of Public Economics*, 29: 25-49
- Bishop R and T Heberlein, Measuring Values of Extramarket Goods: Are Indirect Methods Biased, *American Journal of Agricultural Economics*, 61 (December 1979): 926-930
- Bjornstad D and J Kahn (1996a), Characteristics of Environmental Resources and Their Relevance for Measuring Value, in Bjornstad D and J Kahn eds (1996), *The Contingent Valuation of Environmental Resources*, Edward Elgar, Cheltenham
- Bjornstad D and J Kahn (1996b), Structuring a Research Agenda to Estimate Environmental Values, in Bjornstad D and J Kahn eds (1996), *The Contingent Valuation of Environmental Resources*, Edward Elgar, Cheltenham
- Blaug M (1992), *The Methodology of Economics (second edition)*, Cambridge University Press, Cambridge
- Boadu F (1992), Contingent Valuation for household water in rural Ghana, *Journal of Agricultural Economics*, 43 (September 1992): 458-465
- Bockstael N and McConnell K (1993), Public Goods as Characteristics of Non-market Commodities, *Economic Journal*, 103 (September 1993): 1244-1257

- Bohm P (1994), *CVM Spells Responses to Hypothetical Questions*, *Natural Resources Journal*, 34 Winter 1994: 37-50
- Bohm R, T Essenburg and W Fox (1993), Sustainability of potable water services in the Philippines, *Water Resources Research*, 29(7): 1955-1964
- Bonnieux F and P Le Goff (1997), Valuing the Benefit of Landscape Restoration: a Case Study of the Cotentin in Lower Normandy, France, *Journal of Environmental Management*, 50: 321-333
- Boyle K, M Welsh and R Bishop (1988), Validation of empirical measures of welfare change: comment, *Land Economics*, 64: 94-98
- Breffle W, E Morey and T Lodder (1998), Using Contingent Valuation to Estimate a Neighbourhood's Willingness to Pay to Preserve Undeveloped Urban Land, *Urban Studies*, Volume 35, Number 4 (April 1998): 715-727
- Briscoe J, P de Castro, C Griffin, J North and O Olsen (1990), Towards equitable and sustainable rural water supplies: A Contingent Valuation study in Brazil, *World Bank Economic Review*, 4(2): 115-34
- Brito D and Oakland W (1980), On the Monopolistic Provision of Excludable Public Goods, *American Economic Review*, 70(4): 691-704
- Bromley D (1991), *Environment and Economy: Property Rights and Public Policy*, Blackwell, Oxford
- Brookshire D and D Coursey (1987), Measuring the Valuation of a Public Good: An Empirical Comparison of Elicitation Procedures, *American Economic Review*, 77(4): 554-566
- Brookshire D and M McKee (1994), Is the Glass Half empty, is the Glass Half Full? Compensable Damages and the Contingent Valuation Method, *Natural Resources Journal*, Vol 34: 51-72
- Brookshire D, M Thayer, W Schulze and R d'Arge (1982), Valuing Public Goods: a Comparison of Survey and Hedonic Approaches, *American Economic Review*, 72 (1): 165-177
- Brown C (1990), *Northampton 1835-1985: Shoe Town, New Town*, Phillimore and Co, Chichester, Sussex
- Brown G and W Henry (1989), The Economic Value of Elephants, *Discussion Paper 89-12*, London Environmental Economics Centre
- Brown T, S Barro, M Manfredo and G Peterson, Does Better Information about the Good Avoid the Embedding Effect (1995), *Journal of Environmental Management*, 44: 1-10

- Buckland S, D Macmillan, B Duff and N Hanley (1996), Estimating mean WTP from dichotomous choice contingent valuation studies, *Mimeo, Department of Mathematics and Statistics*, University of St Andrews
- Buchanan J (1965), An economic theory of clubs, *Economics*, 32: 1-14
- Bullock C and J Kay (1997), Preservation and Change in the Upland Landscape: The Public Benefits of Grazing Management, *Journal of Environmental Planning and Management*, 40 (3): 315-334
- Burnham K, D Anderson, G White, C Brownie and K Pollock (1987), *Design and Analysis Methods for Fish Survival Experiments based on Release-Recapture*, American Fisheries Society, Bethesda, Maryland
- Cambridge Economics Inc (1992), *Contingent Valuation: A Critical Assessment*, Cambridge Ma, 1992
- Cameron T (1988), A New Paradigm for Valuing Non-market Goods Using Referendum Data: Maximum Likelihood Estimation by Censored Logistic Regression, *Journal of Environmental Economics and Management*, 15: 355-379
- Cameron T and J Englin (1997), Respondent Experience and Contingent Valuation of Environmental Goods, *Journal of Environmental Economics and Management*, 33: 296-313
- Carson R (1997), Contingent Valuation: Theoretical Advances and Empirical Tests since the NOAA Panel, *American Journal of Agricultural Economics*, 79(5): 1501-1507
- Carson R (1998), Valuation of tropical rainforests: philosophical and practical issues in the use of Contingent Valuation, *Ecological Economics*, 24(1998): 15-29
- Carson R and R Mitchell (1995), Sequencing and Nesting in Contingent Valuation Surveys, *Journal of Environmental Economics and Management*, 28: 155-173
- Carson R, J Wright, A Alberini and N Flores (1995), *A Bibliography of Contingent Valuation Studies*, Natural Resources Damage Assessment Inc, La Jolla, California
- Caswell J ed (1995), *Valuing Food Safety and Nutrition*, Westview Press, Boulder and Oxford
- Champ P, R Bishop, T Brown and D McCollum (1997), Using Donation Mechanisms to Value Nonuse Benefits from Public Goods, *Journal of Environmental Economics and Management*, 33: 151-162
- Choe K, D Whittington, and D Lauria (1996), The Economic Benefits of Water Quality Improvements in Developing Countries: A Case Study of Davao, Philippines, *Land Economics*, 72(4): 519-537

- Cicchetti C and L Wilde (1992), Uniqueness, Irreversibility and the Theory of Nonuse Values, *American Journal of Agricultural Economics*, 74 (December 1992): 1121-1125
- Ciriacy-Wantrup S (1947), Capital Returns from Soil Conservation Practices, *Journal of Farm Economics*, November 1947, 29:1181-1196
- Coase R (1974), The Lighthouse in Economics, *Journal of Law and Economics*, 23 (October): 357-376
- Cobbing P and B Slee (1993), A Contingent Valuation of the Mar Lodge Estate, Cairngorm Mountains, Scotland, *Journal of Environmental Planning and Management*, Vol 36, (1): 65-72
- Combs J, R Kirkpatrick, J Shogren and J Herriges (1993), Matching Grants and Public Goods: A Closed-ended Contingent Valuation Experiment, *Public Finance Quarterly*, April 1993, 21(1): 178-195
- Cooper J (1993), Optimal Bid Selection for Dichotomous Choice Contingent Valuation Surveys, *Journal of Environmental Economics and Management*, 24: 25-40
- Cooper J and J Loomis (1992), Sensitivity of Willingness-to-Pay Estimates to Bid Design in Dichotomous Choice Contingent Valuation Models, *Land Economics*, 68 (May): 211-54
- Coursey D, J Hovis and W Schulze (1987), The Disparity between Willingness to Accept and Willingness to Pay Measures of Value, *Quarterly Journal of Economics*, 102: 679-690
- Cramer J (1971), *Empirical Econometrics*, North-Holland, Amsterdam
- Cramer J (1991), *The Logit Model for Economists*, Edward Arnold, London
- Creel M (1998), A Note on Consistent Estimation of Mean WTP Using a Misspecified Logit Contingent Valuation Model, *Journal of Environmental Economics and Management*, 35: 277-284
- Creel M and J Loomis (1997), Semi-nonparametric Distribution-Free Dichotomous Choice Contingent Valuation, *Journal of Environmental Economics and Management*, 32: 341-358
- Cropper M and W Oates (1992), Environmental Economics: A Survey, *Journal of Economic Literature*, Vol XXX (June 1992): 675-740
- Cummings R, D Brookshire and W Schulze (1986), *Valuing Public Goods: An Assessment of the Contingent Valuation Method*, Rowman and Allenheld, Totowa, NJ

- Cummings R, P Ganderton and T McGuckin (1994), Substitution Effects in CVM Values, *American Journal of Agricultural Economics*, 76 (May 1994): 205-214
- Cummings R and G Harrison (1994), Was the Ohio Court Well Informed in its Assessment of the Accuracy of the Contingent Valuation Method?, *Natural Resources Journal*, Vol 34: 1-36
- Cummings R, G Harrison and E Rutström (1995), Homegrown Values and Hypothetical Surveys: Is the Dichotomous Choice Approach Incentive-Compatible?, *American Economic Review*, 85(1): 260-266
- Danielson L, T Hoban, G van Houtven and J Whitehead (1995), Measuring the benefits of local public goods: environmental quality in Gaston County, North Carolina, *Applied Economics*, 27: 1253-1260
- Dasgupta P and K-G Mäler (1993), *Poverty, Institutions and the Environmental-Resource Base*, World Bank Environment Paper Number 9, World Bank, Washington DC
- Davis R (1963), *The Value of Outdoor Recreation: An Economic Study of the Maine Woods*, doctoral dissertation, Harvard University
- Debreu (1991), The Mathematization of Economic Theory, *American Economic Review*, 81(1) (March 1991): 1-7
- Department of the Environment (1991), *Policy Appraisal and the Environment*, HMSO, London
- Department of the Environment (1994), *Environmental Appraisal in Government Departments*, HMSO, London
- Diamond P and J Hausman (1993), On Contingent Valuation Measurement of Nonuse Values, in J Hausman (1993) ed, *Contingent Valuation: A Critical Assessment*, Elsevier, Amsterdam
- Diamond P and J Hausman (1994), Contingent Valuation: Is some number better than no number?, *Journal of Economic Perspectives*, 8(4), Fall 1994: 45-64
- Dobb I (1993), Individual Travel Cost Method: Estimation and Benefit Assessment with a discrete and possibly grouped dependent variable, *American Journal of Agricultural Economics*, 75 (February 1993): 45-64
- Duffield J and D Patterson (1991), Inference and optimal design for a welfare measure in dichotomous choice contingent valuation models, *Land Economics*, 67: 225-239
- Ehrenberg A and P Mills (1990), *Viewers' Willingness to Pay*, International Thompson Business Publishing, London

- Elegbede P, E Adegeye, A Coker, M Danjuma, C Oduah and A Okanlawon (1977), *Methods for the Provision of Social, Recreational and Cultural Facilities in the Public Authority Housing Areas in Northampton*, Royal Institute of Public Administration, unpublished report
- Freeman A (1993), *The Measurement of Environmental and Resource Values: Theory and Methods*, Resources for the Future, Washington DC
- Friedland R and A Robertson (eds) (1990), *Beyond the Marketplace: Rethinking Economy and Society*, Aldine de Gruyter, New York
- Friedman M (1953), *Essays in Positive Economics*, University of Chicago Press, Chicago
- Frykblom P (1997), Hypothetical Question Modes and Real Willingness to Pay, *Journal of Environmental Economics and Management*, 34: 275-287
- Godfrey L (1988), *Misspecification Tests in Econometrics: the Lagrange Multiplier Principle and other approaches*, Cambridge University Press, New York
- Gradstein M (1993), Rent Seeking and the Provision of Public Goods, *Economic Journal*, 103 (September 1993): 1236-1243
- Grant W (1993), *The Politics of Economic Policy*, Harvester Wheatsheaf, Hemel Hempstead
- Greene W (1991), *Econometric Analysis*, Maxwell Macmillan, New York
- Greene W (1994), *LIMDEP Version 7.0*, Econometric Software Inc, Bellport NY
- Gregory R (1986), Interpreting Measures of Economic Loss: Evidence from Contingent Valuation and Experimental Studies, *Journal of Environmental Economics and Management*, 13: 325-337
- Gronberg T and H Hwang (1992), On the Privatization of Excludable Public Goods, *Southern Economic Journal*, 58 (April 1992): 904-921
- Gujurati D (1992), *Essentials of Econometrics*, McGraw-Hill, New York
- Haab T and K McConnell (1997), Referendum Models and Negative Willingness to Pay: Alternative Solutions, *Journal of Environmental Economics and Management*, 32: 251-270
- Hanemann M (1984), Welfare Evaluations in Contingent Valuation Experiments with Discrete Responses, *American Journal of Agricultural Economics*, 66 (Aug): 332-341

- Hanemann M (1989), Welfare Evaluations in Contingent Valuation Experiments with Discrete Response Data: Reply, *American Journal of Agricultural Economics*, 71 (Nov): 1057-1061
- Hanemann M (1991), Willingness to Pay and Willingness to Accept: How much can they differ?, *American Economic Review*, June 1991, 81: 635-47
- Hanley N and S Craig (1991), Wilderness development decisions and the Krutilla-Fisher model: the case of Scotland's flow country, *Ecological Economics*, 4: 145-164
- Hanley N, D MacMillan, R Wright, C Bullock, I Simpson, D Parsisson and B Crabtree (1998), Contingent Valuation versus Choice Experiments: Estimating the Benefits of Environmentally Sensitive Areas in Scotland, *Journal of Agricultural Economics*, January 1998
- Hanley N and R Ruffell (1993), Contingent Valuation of Forest Characteristics: Two Experiments, *Journal of Agricultural Economics*, 44 (May 1993): 218-229
- Harrison G and B Kriström (1995), On the interpretation of responses to contingent valuation surveys in Johansson P-O, B Kriström and K Mahler (eds) (1995), *Current Issues in Environmental Economics*, Manchester University Press, Manchester
- Harrison G and J Lesley (1996), Must Contingent Valuation Surveys Cost so much?, *Journal of Environmental Economics and Management*, 29: 79-95
- Hausman J ed (1993), *Contingent Valuation: A Critical Assessment*, North Holland, Amsterdam
- Helsley R and W Strange (1994), Exclusion and the private enforcement of property rights, *Journal of Public Economics* 53 (1994): 291-308
- Herriges J and J Shogren (1996), Starting Point Bias in Dichotomous Choice Valuation with Follow-Up Questioning, *Journal of Environmental Economics and Management*, 30: 112-131
- Hoehn J (1987), Contingent Valuation in Fisheries: the design of satisfactory contingent valuation formats, *Transactions of American Fisheries Society*, volume 116, 1987
- Hoehn J (1991), Valuing the Multidimensional Impacts of Environmental Policy: Theory and Methods, *American Journal of Agricultural Economics*, 73 (May 1991) : 289-299
- Hosmer D and S Lemeshow (1989), *Applied Logistic Regression*, Wiley, New York
- Hutchinson W, S Chilton and J Davis (1995), Measuring Non-use Value of Environmental Goods using the Contingent Valuation Method: Problems of

Information and Cognition and the Application of the Cognitive Questionnaire Design Methods, *Journal of Agricultural Economics*, 1995: 97-112

Irwin J, P Slovic, S Lichtenstein and G McClelland (1993), Preference Reversals and the Measurement of Environmental Values, *Journal of Risk and Uncertainty*, 6: 5-18

Jimenez E (1987), *Pricing Policy in the Social Sectors: Cost Recovery for Education and Health in Developing Countries*, World Bank, Washington DC

Johannesson M, P-O Johansson, B Jonsson (1992), Economic Evaluation of Drug Therapy: A Review of the Contingent Valuation Method, *Pharmacoeconomics*, 1(5): 325-337

Jones-Lee M, G Loomes and P Philips (1995), Valuing the Prevention of Non-Fatal Road Injuries: Contingent Valuation vs. Standard Gambles, *Oxford Economic Papers*, 47: 676-695

Judge G, R Carter Hill, W Griffiths, H Lütkepohl, T-Chao Lee (1988), *Introduction to the Theory and Practice of Econometrics (Second Edition)*, Wiley, New York

Kahneman D, P Slovic and A Tversky (1982), *Judgement under Uncertainty: Heuristics and Biases*, Cambridge University Press, New York

Kahneman D and J Knetsch (1992), Valuing Public Goods: The Purchase of Moral Satisfaction, *Journal of Environmental Economics and Management*, 22 (1992): 57-70

Kahneman D and I Ritov (1994), Determinants of Stated Willingness to Pay for Public Goods: A Study in the Headline Method, *Journal of Risk and Uncertainty*, 9 (July): 5-38

Kanninen B (1993), Optimal Experimental Design for Double-Bounded Choice Contingent Valuation, *Land Economics*, 69 (May): 138-46

Kanninen B (1995), Bias in Discrete Response Contingent Valuation, *Journal of Environmental Economics and Management*, 28 : 114-25

Kask S and S Maani (1992), Uncertainty, Information and Hedonic Pricing, *Land Economics*, 68 (May 1992): 170-184

Kealy M, M Montgomery and J Dovidio (1990), Reliability and Predictive Validity of Contingent Values: Does the Nature of the Good Matter?, *Journal of Environmental Economics and Management*, 19: 244-263

Kealy M and R Turner (1993), A Test of the Equality of Closed-Ended and Open-Ended Contingent Valuation, *American Journal of Agricultural Economics*, 75 (May 1993):

- Knetsch J and J Sinden (1984), Willing to pay and compensation demanded: experimental evidence of an unexpected disparity in measures of value, *Quarterly Journal of Economics*, 94: 507-521
- Kopp R and Portney P (1985), *Valuing the Outputs of Environmental Programs: A Scoping Study*, report prepared for the Electric Power Research Institute, Resources for the Future, Washington DC
- Kramer R and D Mercer (1997), Valuing a Global Environmental Good: US Residents' WTP to Protect Tropical Rain Forests, *Land Economics*, 73(2): 196-210
- Krström B (1990), A Non-Parametric Approach to the Estimation of Welfare Measures in Discrete Response Valuation Studies, *Land Economics*, 66 (May 1990): 135-139
- Krström B (1993) Comparing continuous and discrete valuation questions, *Environmental and Resource Economics*, 3: 63-71
- Krström B (1997), Spike Models in Contingent Valuation, *American Journal of Agricultural Economics*, 79:1013-1023
- Krutilla J (1967), Conservation Reconsidered, *American Economic Review*, 57: 777-786
- Lake I, I Bateman and J Parfitt (1996), Assessing a Kerbside Recycling Scheme: A Quantitative and Willingness to Pay Case Study, *Journal of Environmental Management*, 46: 239-254
- Langford I, I Bateman, A Jones, H Langford and S Georgiou (1998), Improved Estimation of Willingness to Pay in Dichotomous Choice Contingent Valuation Studies, *Land Economics*, 74(1): 65-75
- Lankford R (1988), Measuring Welfare Changes in Settings with Imposed Quantities, *Journal of Environmental Economics and Management*, 15: 45-63
- Larson D (1992), Can Nonuse Value be measured from Observable Behaviour, *American Journal of Agricultural Economics*, 74 (December 1992): 1114-1120
- Lawson T (1997), *Economics and Reality*, Routledge, London
- Layard R and A Walters (1978), *Microeconomic Theory*, McGraw-Hill International, New York
- Lazo J, W Schulze, G McClelland and J Doyle (1992), Can Contingent Valuation Measure Nonuse Values?, *American Journal of Agricultural Economics*, 74 (December 1992): 1126-1132

- Le Goffe P (1995), The Benefits of Improvements in Coastal Water Quality: A Contingent Approach, *Journal of Environmental Management*, 45: 305-317
- León C (1996), Double Bounded Survival Values for Preserving the Landscape of Natural Parks, *Journal of Environmental Management*, 46(2): 103-118
- Leontief W (1970), Theoretical Assumptions and Nonobserved Facts, *American Economic Review*, 60 (1) (March 1970): 1-7
- Li C-Z and L Mattsson (1995), Discrete Choice under Preference Uncertainty: An Improved Structural Model for Contingent Valuation, *Journal of Environmental Economics and Management*, 28: 256-269
- Liao T Futing (1994), *Interpreting Probability Models: Logit, Probit and Other Generalized Models*, Sage, London
- Lodewijks J (1994), Anthropologists and economists: conflict or cooperation?, *Journal of Economic Methodology*, 1(1): 81-1
- Loomis J (1996), How large is the extent of the market for public goods: evidence from a nationwide contingent valuation survey, *Applied Economics*, 1996, 28: 779-782
- Loomis J, A Gonzalez-Caban and R Gregory (1994), Do Reminders of Substitutes and Budget Constraints Influence Contingent Valuation Estimates?, *Land Economics*, 70: 499-506
- Lunander A (1998), Inducing Incentives to Understate and to Overstate Willingness to Pay within the Open-Ended and Dichotomous Choice Elicitation Formats, *Journal of Environmental Economics and Management*, 35: 88-102
- McCloskey D (1985), *The Rhetoric of Economics*, The University of Wisconsin Press, Madison
- McConnell K (1997), Does Altruism Undermine Existence Values?, *Journal of Environmental Economics and Management*, 32: 22-37
- McFadden D (1974), The Measurement of Urban Travel Demand, *Journal of Public Economics*, 3:303-28
- McFadden D (1994), *Contingent Valuation and Social Choice*, American Journal of Agricultural Economics, 76(4): 689-708
- Maddala G (1983), *Limited-Dependent and Qualitative Variables in Econometrics*, Cambridge University Press, Cambridge

- Margai F (1995), Evaluating the Potential for Environmental Quality Improvement in a Community Distressed by Manmade Hazards, *Journal of Environmental Management*, 44: 181-190
- Markandya A (1988), The value of the environment: a state of the art survey, *Journal of Environmental Economics and Management*, 1988
- Mayer T (1993), Friedman's Methodology of Positive Economics: a soft reading, *Economic Inquiry*, 31 (April 1993): 213-23
- Mitchell R and R Carson (1989), *Using Surveys to Value Public Goods: The Contingent Valuation Method*, Resources for the Future, Washington DC
- Mitchell R and R Carson (1995), Current Issues in the Design, Administration and Analysis of Contingent Valuation Surveys, in Johansson, P, B Kriström and K Mäler (1995), *Current Issues in Environmental Economics*, Manchester University Press, Manchester
- More T, J Averill and T Stevens (1996), Values and Economics in Environmental Management: A Perspective and Critique, *Journal of Environmental Management*, 48: 397-409
- Munasinghe M and E Lutz (1993), Environmental Economics and Valuation in Development Decisionmaking, in Munasinghe M ed (1993), *Environmental Economics and Natural Resource Management in Developing Countries*, World Bank, Washington DC
- Musgrave R (1969), Provision for social goods, in J Margolis and H Guitton (eds), *Public Economics*, Macmillan, London
- Navrud S ed (1992), *Pricing the European Environment*, Scandinavian University Press/Oxford University Press, Oxford
- Navrud S and E Mungatana (1994), Environmental valuation in developing countries: The recreational value of wildlife viewing, *Ecological Economics*, 11 (November 1994): 135-151
- Neill H (1995), The Context for Substitutes in CVM Studies: Some Empirical Observations, *Journal of Environmental Economics and Management*, 29: 393-397
- Nickerson C (1995), Does Willingness to Pay Reflect the Purchase of Moral Satisfaction? A Reconsideration of Kahneman and Knetsch, *Journal of Environmental Economics and Management*, 28: 126-133
- Northampton Borough Council (1995), *Council Tax 1995-6*, Northampton Borough Council Revenue Services, Northampton

- Northampton Borough Council (1996), *Council Tax 1996-7*, Northampton Borough Council Revenue Services, Northampton
- O'Neill J (1997), Value Pluralism, Incommensurability and Institutions in J Foster ed (1997), *Valuing Nature? Economics, Ethics and the Environment*, Routledge, London
- O'Reilly D, J Hopkin, G Loomes, M Jones-Lee, P Philips, K McMahon, D Ives, B Soby, D Ball and R Kemp (1994), The Value of Road Safety, *Journal of Transport Economics and Policy*, (January 1994): 45-59
- Ozuna T, Kee Yoou Jang and J Stoll (1993), Testing for Misspecification in the Referendum Contingent Valuation Approach, *American Journal of Agricultural Economics*, 75 (May 1993): 332-338
- Pearce D and A Markandya (1989), *Environmental Policy Benefits: Monetary Valuation*, OECD
- Pearce D and J Warford (1993), *World Without End: Economics, Environment and Sustainable Development*, Oxford University Press, New York
- Penning-Rowsell E, C Green, R Thompson, A Coker, S Tunstall, C Richard and D Parker (1992), *The Benefits of Coastal Protection and Sea Defence: A Manual of Assessment Techniques*, Belhaven, London
- Pigou A (1952), *The Economics of Welfare* (Fourth Edition), Macmillan, London
- Poole R Jnr (1980), *Cutting Back City Hall*, Universe Books, New York
- Portney P (1994), The Contingent Valuation Debate: Why Economists should care, *Journal of Economic Perspectives*, Vol 8(4), Fall 1994: 3-17
- Powell J (1993), *The Value of Upland Vegetation: A Report on the Contingent Valuation Study in the United Kingdom*, ECOTEC Research and Consulting, Birmingham
- Quiggin J (1998), Individual and Household Willingness to Pay for Public Goods, *American Journal of Agricultural Economics*, 80 (February 1998): 58-63
- Randall A (1992), Letter in *Country Reports for the CVM Network*, quoted in Hutchinson et al (1995)
- Randall A (1993), What Practising Agricultural Economists Really Need to know about Methodology, *American Journal of Agricultural Economics*, 75 (October 1993): 48-59
- Randall A (1997), The NOAA Panel Report: A New Beginning or the End of an Era?, *American Journal of Agricultural Economics*, 79 (5): 1489-1494

- Randall A and J Stoll (1980), Consumers Surplus in Commodity Space, *American Economic Review*, 71 (June 1980): 48-59
- Ready R, J Buzby and D Hu (1996), Differences between Continuous and Discrete Contingent Valuation Estimates, *Land Economics*, 72(3): 397-411
- Ready R, J Whitehead and G Blomquist (1995), Contingent Valuation Responses when Respondents are Ambivalent, *Journal of Environmental Economics and Management*, 29: 181-196
- Roth A (1988), Laboratory Experimentation in Economics: a Methodological Overview, *Economic Journal* 98 (December 1988): 974-1031
- Royal Parks Review (1992), *Hyde Park and Kensington Gardens*, Royal Parks Agency, Hyde Park, London
- Sagoff M (1994), Four Dogmas of Environmental Economics, *Environmental Values*, Winter 1994: 285-310
- Samuelson P (1954), Pure Theory of Public Expenditures, *Review of Economics and Statistics*, 37 (1954): 387-9
- Schkade D and J Payne (1993), Where do the Numbers Come From? How People Respond to Contingent Valuation Questions, in Hausman J ed (1993), *Contingent Valuation: A Critical Assessment*, North Holland, Amsterdam
- Schkade D and J Payne (1994), How People Respond to Contingent Valuation Questions: A Verbal Protocol Analysis of Willingness to Pay for an Environmental Regulation, *Journal of Environmental Economics and Management*, 26: 88-109
- Seber G (1982), *The Estimation of Animal Abundance and Related Parameters (second edition)*, Griffin, London
- Seip K and J Strand (1992), Willingness to Pay for Environmental Goods in Norway: A Contingent Valuation Study with Real Payment, *Environmental and Resource Economics*, 2(1): 91-106
- Sen A (1977), Rational Fools: a critique of the behavioural foundations of economic theory, *Philosophy and Public Affairs*, 6(4): 327-44
- Shogren J, Y Seung, D Hayes and J Kliebenstein (1994), Resolving Differences in Willingness to Pay and Willingness to Accept, *American Economic Review*, March 1994: 255-270
- Shyamsundar P and R Kramer (1996), Tropical Forest Protection: An Empirical Analysis of the Costs Borne by Local People, *Journal of Environmental Economics and Management*, 31: 129-144

- Signorello G (1992), La stima dei valori di esistenza con il metodo della valutazione contingente, *Rivista di Economia Agraria*, XLVII(4): 691-697
- Silberman J, D Gerlowski and N Williams (1992), *Estimating Existence Values for Users and Nonusers of New Jersey Beaches*, *Land Economics*, 68(2), May 1992: 225-236
- Silva C and C Kahn, Exclusion and moral hazard, *Journal of Public Economics*, 52 (1993): 217-235
- Singh B, R Ramasubban, R Bhatia, J Briscoe, C Griffin and C Kim (1993), Rural water supply in Kerala, India: how to emerge from a low-level equilibrium trap, *Water Resources Research*, 29(7): 1931-1942
- Smith V (1994), Lightning Rods, Dart Boards and Contingent Valuation, *Natural Resources Journal*, 34: 121-149
- Smith V (1996), Can Contingent Valuation Distinguish Economic Values for Different Public Goods, *Land Economics*, 72(2): 139-151
- Smith V and L Osborne (1996), Do Contingent Valuation Estimates Pass a "Scope" Test? A Meta-Analysis, *Journal of Environmental Economics and Management*, 31: 287-301
- Smith V, X Zhang and R Palmquist (1997), Marine Debris, Beach Quality and Non-market Values, *Environmental and Resource Economics*, 10(3): 223-247
- Soguel N (1995), Costing the Traffic Barrier Effect: A Contingent Valuation Survey, *Environmental and Resource Economics*, 6: 301-308
- Spash C (1993), Estimating the importance of inviolable rights: the case of long-term damages and future generations, *Unpublished report to the Scottish Economic Society*
- Spash C (1997a), Ethics and Environmental Attitudes with Implications for Economic Valuation, *Journal of Environmental Management*, 50: 403-416
- Spash C (1997b), Environmental Management without Environmental Valuation? in J Foster ed (1997), *Valuing Nature? Economics, Ethics and the Environment*, Routledge, London
- Strand J and A Taraldset (1991), The valuation of environmental goods in Norway: A Contingent Valuation study with multiple bias testing, *University of Oslo working paper*, March 1991
- Swallow B and M Woudyalew (1994), Evaluating willingness to contribute to a local public good: application of contingent valuation to tsetse control in Ethiopia, *Ecological Economics*, 11 (November 1994): 153-161

Thayer M (1981), Contingent Valuation Techniques for Assessing Environmental Impacts: Further Evidence, *Journal of Environmental Economics and Management*, 8: 27-44

Tiebout C (1956), A Pure Theory of Local Expenditures, *Journal of Political Economy*, 64: 416-424

Tietenberg T (1992), *Environmental and Natural Resource Economics (Third Edition)*, Harper Collins, New York

Tobin J (1958), Estimation of Relationships for Limited Dependent Variables, *Econometrica*, 26 (January 1958): 24-36

Turner R (1993), *Sustainable Environmental Economics and Management: Principles and Practice*, Belhaven Press, London

Tversky A, P Slovic and D Kahneman (1990), The Causes of Preference Reversal, *American Economic Review*, 80: 204-217

Vatn A and D Bromley (1994), Choices without Prices without Apologies, *Journal of Environmental Economics and Management*, 26 (1994): 129-148

Wang (1997), Treatment of "Don't Know" Responses in Contingent Valuation Surveys: A Random Valuation Model, *Journal of Environmental Economics and Management*, 32: 219-232

Welch D (1995), *Managing Public Use of Parks, Open Spaces and Countryside*, Pitman, London

Weisbrod B (1964), Collective Consumption Services of Individual Consumption Goods, *Quarterly Journal of Economics*, 78:471-477

Welch D (1995), *Managing Public Use of Parks, Open Spaces and Countryside*, Pitman, London

Wilson and Womersley (1969), *Northampton Master Plan*, Northampton Borough Council and Northampton Development Corporation, Northampton

Whitehead J (1992), Ex ante willingness to pay with supply and demand uncertainty: implications for valuing a sea turtle protection programme, *Applied Economics*, 24 (September): 981-988

Whitehead J, P Groothuis and G Blomquist (1993), Testing for non-response and sample selection bias in contingent valuation, *Economics Letters*, 41: 215-220

Whitehead J, G Blomquist, T Hoban and W Clifford (1995), Assessing the Validity and Reliability of Contingent Values: A Comparison of On-Site Users, Off-site Users, and Non-users, *Journal of Environmental Economics and Management*, 29: 238-251

Whittington D, J Briscoe, X Mu and W Barron (1990), Estimating the willingness to pay for water services in developing countries: A case study of the Contingent Valuation method in Haiti, *Economic Development and Cultural Change*, 38(4): 293-311

Whittington D, V Kerry Smith, A Okorafor, A Okore, J Long Liu and A McPhail (1992), Giving Respondents Time to Think in Contingent Valuation Studies: A Developing Country Application, *Journal of Environmental Economics and Management*, 22 (1992): 205-225

Whittington D, D Lauria, A Wright, K Choe, J Hughes and V Swarna (1993), Household Demand for Improved Services in Kumasi, Ghana: A Contingent Valuation Study, *Water Resources Research*, 29 (6) (June 1993): 1539-1560

Wierstra E, A van der Veen and P Geurts (1996), Monetaire waardering van milieuveranderingen: de Contingent Valuation methode, *Maandschrift Economie*, 60: 155-176

Willig R (1976), Consumers Surplus without Apology, *American Economic Review*, 66 (September 1976): 587-597

Willis K and G Garrod (1991), Valuing open access recreation on inland waterway: on-site recreation surveys and selection effects, *Regional Studies*, 25: 511-524

Wilson and Womersley (1969), *Northampton Master Plan*, Northampton Borough Council and Northampton Development Corporation, Northampton

Woolham J (1995), *A Profile of the Eastern District of Northampton: A Report Prepared for Northampton Locality Co-ordinating Group*, Joint Research Steering Group, Northampton

World Commission on Environment and Development (1987), *Our Common Future*, Oxford University Press, Oxford